144MHz FM TRANSCEIVER

IC-25A/E

MAINTENANCE MANUAL

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SPECIFICATIONS

GENERAL

Numbers of semiconductors	:	Transistors	48
		FETs	5
		ICs	21 (IC-25A: 20)
		Diodes	89 (IC-25A: 91)
Frequency coverage	:	144.000 ~ 145.995 MHz (IC-25A: 143.800 ~ 148.195 MHz)	
Frequency resolution	:	5 kHz/25 kHz steps (IC-25A: 5 kHz/15 kHz steps)	
Frequency control	:	Microcomputer based 5 kHz step Digital PLL synthesizer Independent Dual VFO Capability.	
Frequency stability	:	Within ± 1.5 kHz	
Frequency channels	:	5 channels with any inband frequency programmable	
Usable conditions	:	Temperature:	–10°C ~ 60°C (14°F ~ 140°F)
		Operational time:	continuous
Antenna impedance	:	50 ohms unbalanced	
Power supply requirement	:	13.8V DC ± 15% (negative ground) 6A Max.	
Current drain (at 13.8V DC)	:	Transmitting	
		HIGH (25W)	Approx. 4.8A
		LOW (1W)	Approx. 1.3A
		Receiving	
		At max audio output	Approx. 0.6A
		Squelched	Approx. 0.4A
Dimensions	:	50 mm (H) x 140 mm (W) x 177 mm (D)	
Weight	:	Approx. 1.5 kg	

TRANSMITTER

Output power	:	25W (HIGH), 1W (LOW)
Emission mode	:	16F3
Modulation system	:	Variable reactance frequency modulation
Max. frequency deivation	:	5 kHz
Spurious emission	:	More than 60 dB below carrier
Microphone	:	1.3 K ohm dynamic microphone with built-in preamplifier and push-to-talk switch
Operating mode	:	Simplex, Duplex (Any inband frequency separation programmable)
Tone burst	:	1750 Hz ± 0.1 Hz (IC-25A: Not installed)

RECEIVER

Receiving system	:	Double-conversion superheterodyne
Modulation acceptance	:	$16F_3$
Intermediate frequency	:	1st: 16.9 MHz
		2nd: 455 kHz
Sensitivity	:	More than 30 dB S+N+D/N+D at 1μV
		Less than 0.6μV for 20 dB Noise quieting
Squelch sensitivity	:	Less than 0.4μV
Spurious response rejection ratio	:	More than 60 dB
Selectivity	:	More than ±7.5 kHz at –6 dB point
		Less than ±15 kHz at –60 dB point
Audio output power	:	More than 2.0W
Audio output impedance	:	4 ~ 8 ohms

CONTROLS AND THEIR FUNCTIONS

FRONT PANEL

(1) VFO SWITCH

For selection of either VFO "A" or "B" for tuning.

In the "A" position, the VFO indicator illuminates and the frequency is changed in 5-kHz steps when the tuning control knob is turned. The frequency can be entered into any of the memory channels.

In the "B" position, the frequency is changed in 25-kHz steps (IC-25A: 15-kHz steps) when the tuning control knob is turned.

(2) VFO INDICATOR

This LED illuminates when VFO "A" is selected.

(3) PRIORITY INDICATOR

This LED illuminates when the priority function is switched ON.

(4) PRIORITY BUTTON

This switch is used to switch the priority function ON and OFF.

During a QSO or VFO reception, a calling channel or other desired channel can be monitored (whether the channel is in use or not) by setting the memory channel switch to that channel which has been memorized in a memory channel, and then press the priority button. The receiving frequency will thereafter automatically change to that channel for a moment every five seconds.

(5) FREQUENCY DISPLAY

The displayed frequency is the carrier frequency. The three large 7-segment LED's display the digits between 1 MHz and 10 kHz, and for 5 kHz of the operating frequency.

(6) RECEIVE INDICATOR

This LED illuminates when, during the RECEIVE mode, the squelch is opened.

(7) TRANSMIT INDICATOR

This LED illuminates in the TRANSMIT mode.

(8) VFO SCAN-FUNCTION SWITCH

This switch is used to select either full scan or program scan.

(9) S/RF INDICATOR

The seven in-line LED's indicate the S-unit and the RF output level. The digits of the S-meter represent S1 through S9 and 20 and 60 dB over S9. The RF output level meter functions only as a relative output meter; it does not indicate the wattage. These functions are automatically switched when T/R is switched.

(10) SIMPLEX/DUPLEX SWITCH

This switch is used to select either SIMPLEX operation or DUPLEX (repeater) operation.

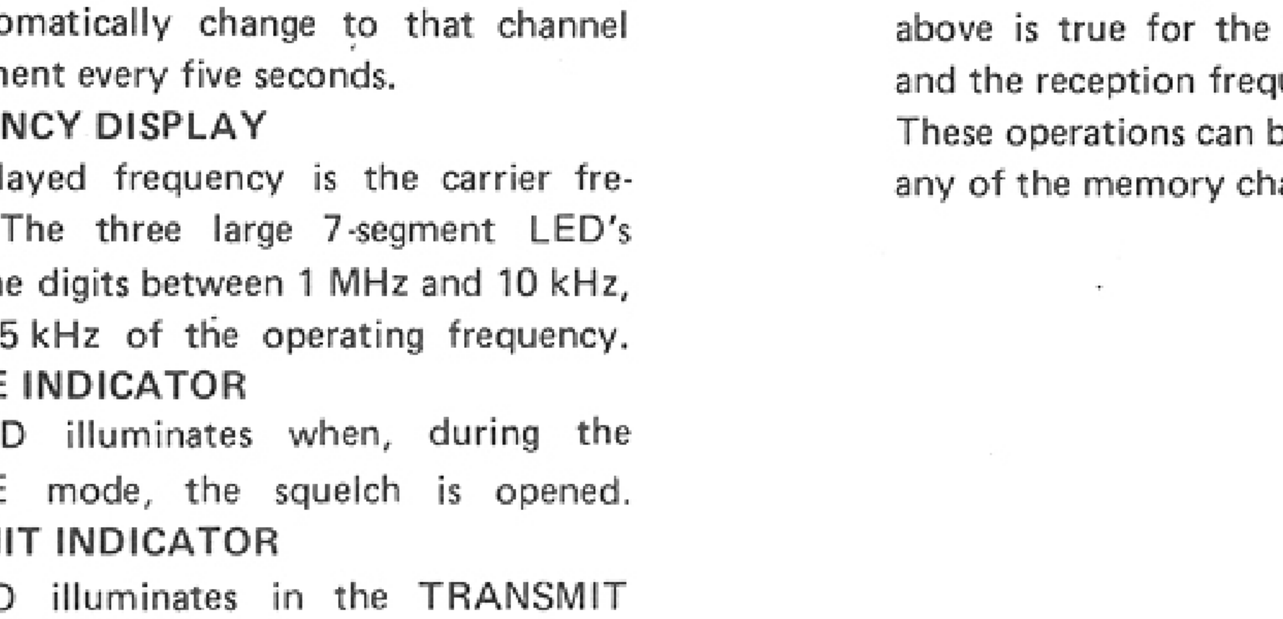
(11) DUPLEX-MODE SWITCH

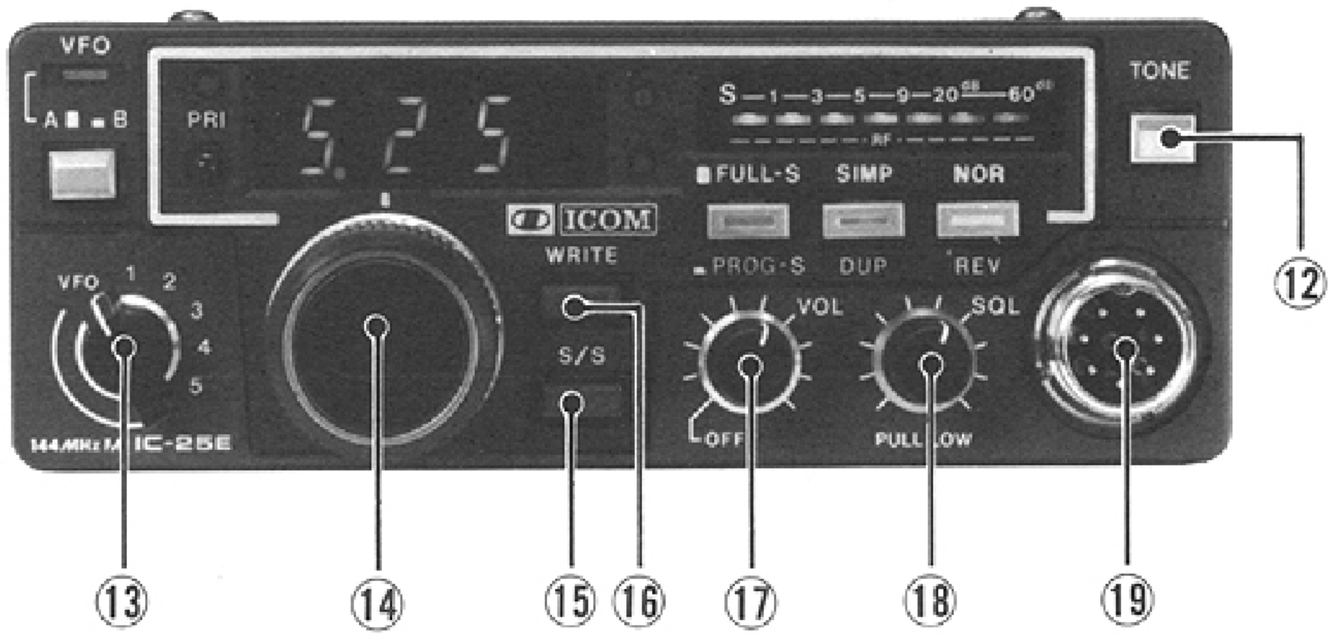
The switch is used to select the relationship of the reception frequency and the transmission frequency in the duplex mode.

In the "NOR" position, the transmission frequency is set to 600 kHz (This can be changed to any in-band frequency.) below the reception frequency. (IC-25A: The transmission frequency can be set to either above or below the reception by using the OFFSET switch.)

In the "REV" position, the reverse of the above is true for the transmission frequency and the reception frequency.

These operations can be used with the VFO or any of the memory channels.





(12) TONE CALL SWITCH (IC-25E only)
Most repeaters require a 1750-Hz tone burst for initial access. Pressing this switch for the required period for a repeater switches the unit to the transmit mode, and the tone-burst generator is activated, thus giving access to the repeater.

(12) OFFSET SWITCH (IC-25A only)
In the "+" position, the transmission frequency is set to 600 kHz (This can be changed to any in-band frequency.) above the reception frequency (when the DUPLEX MODE switch is in the "NOR" position).
In the "—" position, the transmission frequency is set 600 kHz below the reception frequency. In addition, the offset frequency can be changed to any in-band frequency (when the DUPLEX MODE switch is in the "NOR" position).

(13) VFO/MEMORY CHANNEL SWITCH
This switch is used to select either operation with the tuning control ("VFO" position) or operation with the memory channels (1 ~ 5).

(14) TUNING CONTROL KNOB
Turning this control clockwise increases the frequency, and turning it counterclockwise decreases the frequency. At the VFO "A" setting, the frequency is changed in 5-kHz steps, and at the VFO "B" setting, it is changed in 25-kHz (IC-25A: 15-kHz) steps. When this control is turned to a frequency exceeding 145.995 MHz (IC-25A: 148.195-MHz), the frequency will automatically revert to 144.000 MHz (IC-25A: 143.800 MHz). In the same way, when this control is turned to a frequency below 144.000 MHz (143.800-MHz), the frequency will automatically revert to 145.995 MHz (148.195 MHz).

(15) SCAN START/STOP BUTTON
This button is used to start and stop any of the scan functions. When it is pressed once again to restart the scan, the scan will start from the memory channel or frequency where it was stopped.

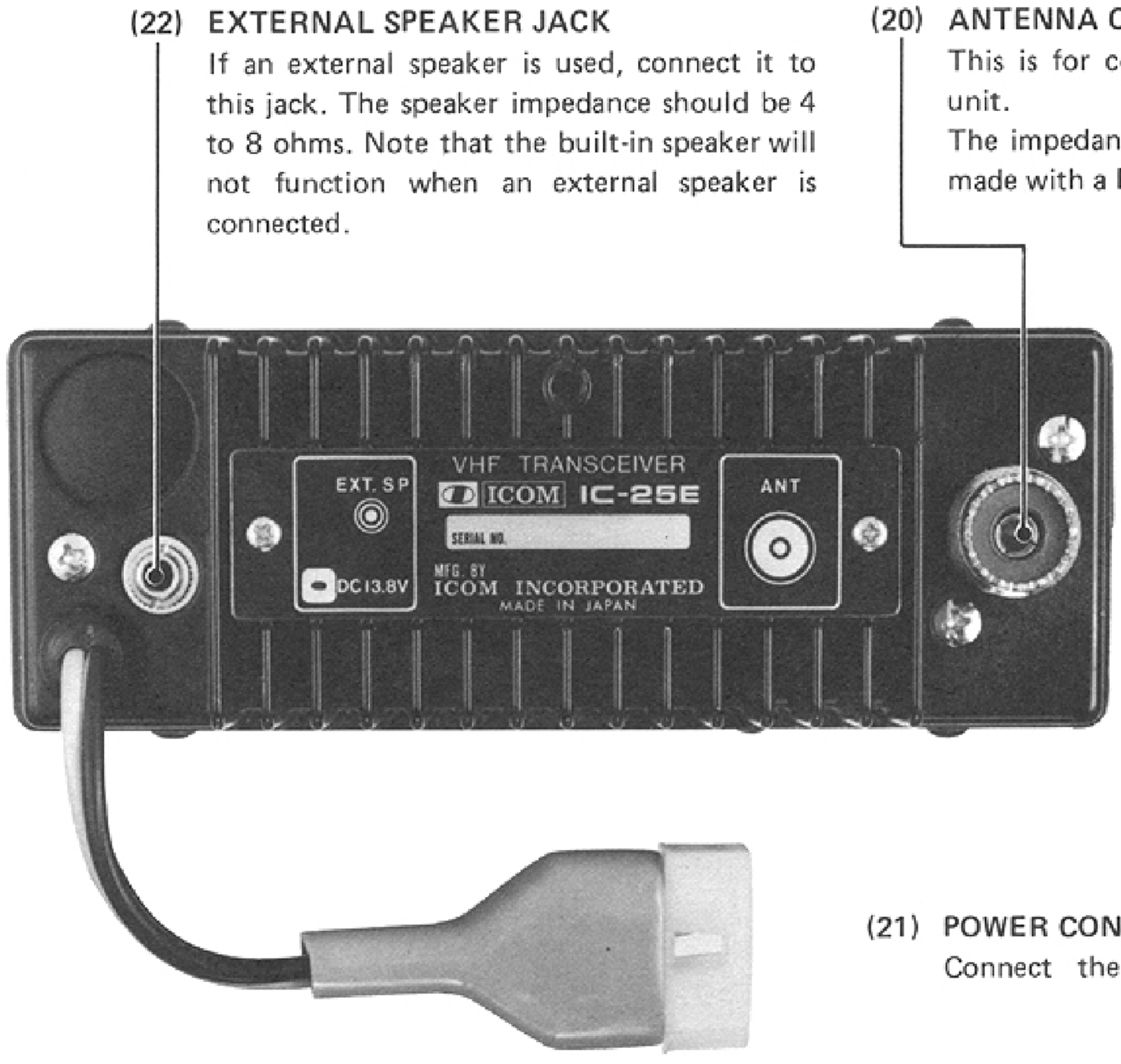
(16) MEMORY/VFO WRITE BUTTON
When this button is pressed, the VFO A frequency is "written" into a memory channel, or the frequency of one VFO is transferred to the other VFO.

(17) VOLUME CONTROL/POWER SWITCH
The power is OFF when this control is turned completely counterclockwise. The power can be switched ON by turning this control clockwise until a "click" is heard. The audio level is increased as the control is turned further clockwise.

(18) SQUELCH CONTROL/RF POWER SWITCH
The squelch threshold is increased by turning this control clockwise. Turn it completely counterclockwise to turn the squelch function OFF.
When this knob is pulled outward, the RF output power is reduced to 1 watt. When it is pressed inward to the normal position, the RF output power is returned to 25 watts.

19) MIC CONNECTOR
Connect the microphone (included) to this connector.
(If you want to use a different microphone, refer to the illustration on page 5.)

REAR PANEL



(22) EXTERNAL SPEAKER JACK

If an external speaker is used, connect it to this jack. The speaker impedance should be 4 to 8 ohms. Note that the built-in speaker will not function when an external speaker is connected.

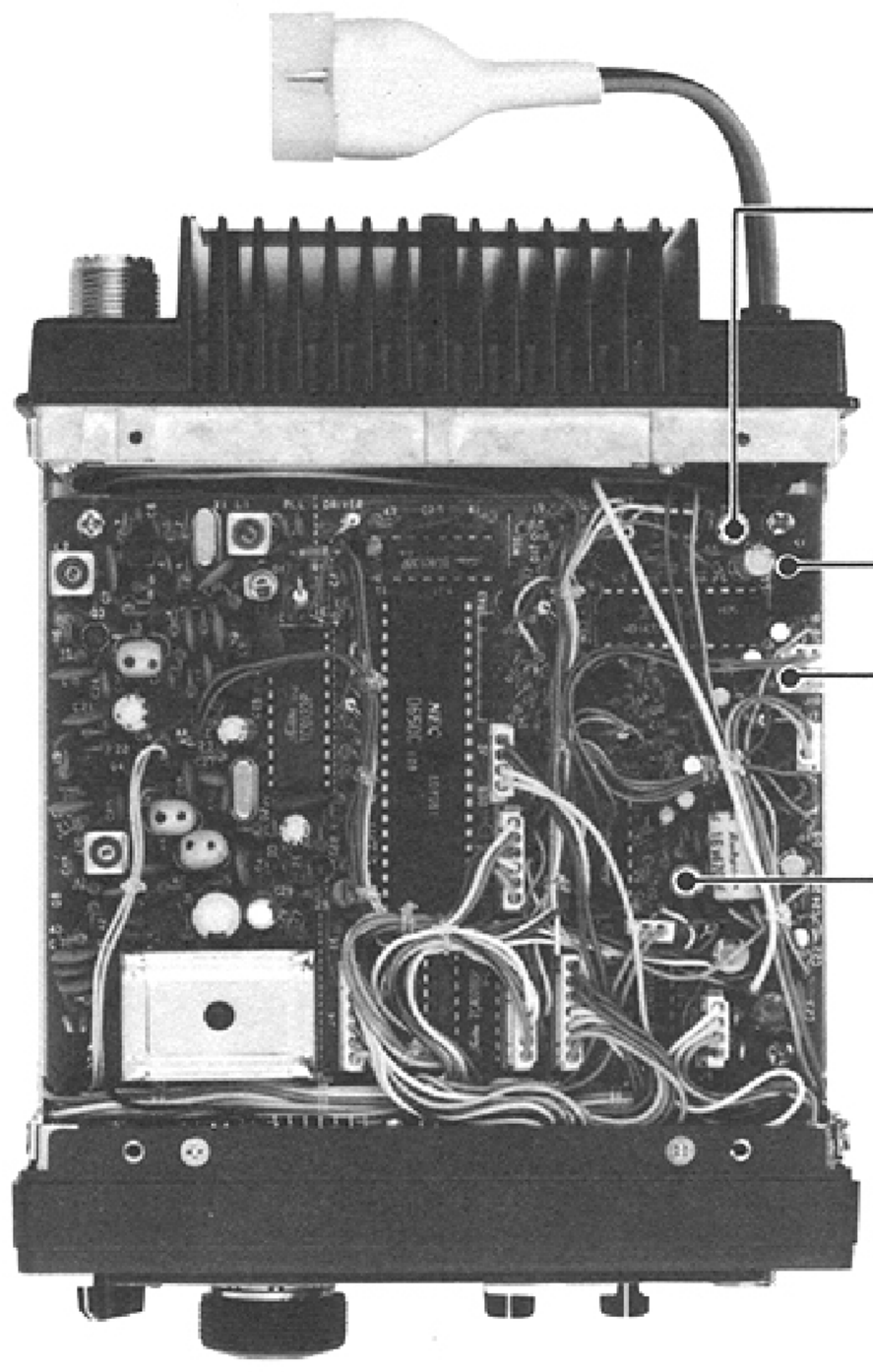
(20) ANTENNA CONNECTOR

This is for connection of the antenna to the unit.
The impedance is 50 ohms. The connection is made with a PL-259 connector.

(21) POWER CONNECTOR

Connect the power cord (included) here.

UNDER THE TOP COVER



(25) SCAN-STOP TIME CONTROL

This control is used to set the interval of the scan automatic-stop time. It can be adjusted to the desired interval within a range of 5 to 20 seconds.

(24) SCAN-STOP TIMER SWITCH

This switch is used to switch the scan-stop interval function ON or OFF.

(26) SCAN-STOP FUNCTION SWITCHING SOCKETS

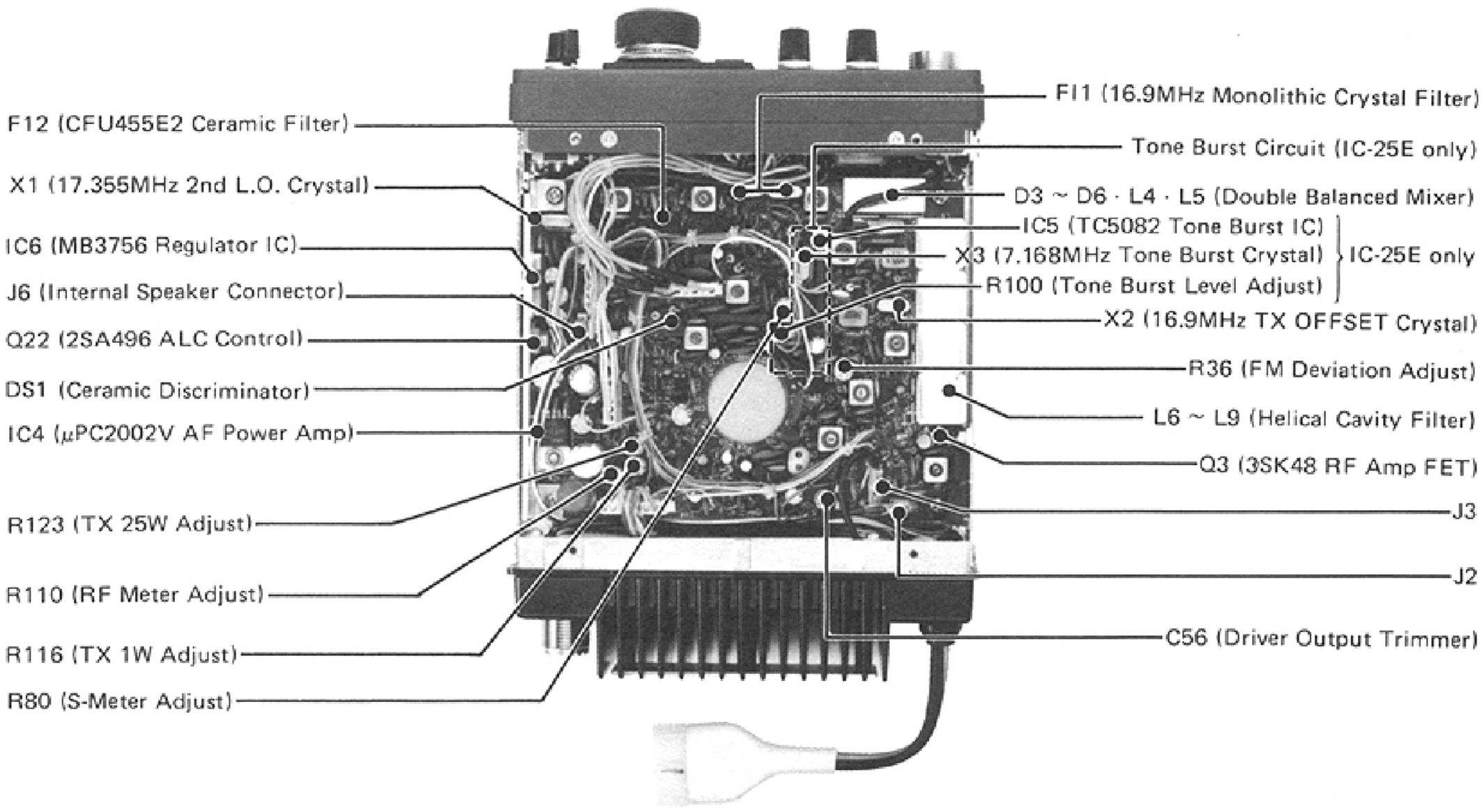
By changing the socket, the scan-stop function is switched to either "stop on a busy channel" or "stop on an unused channel".

(23) SCAN-SPEED CONTROL

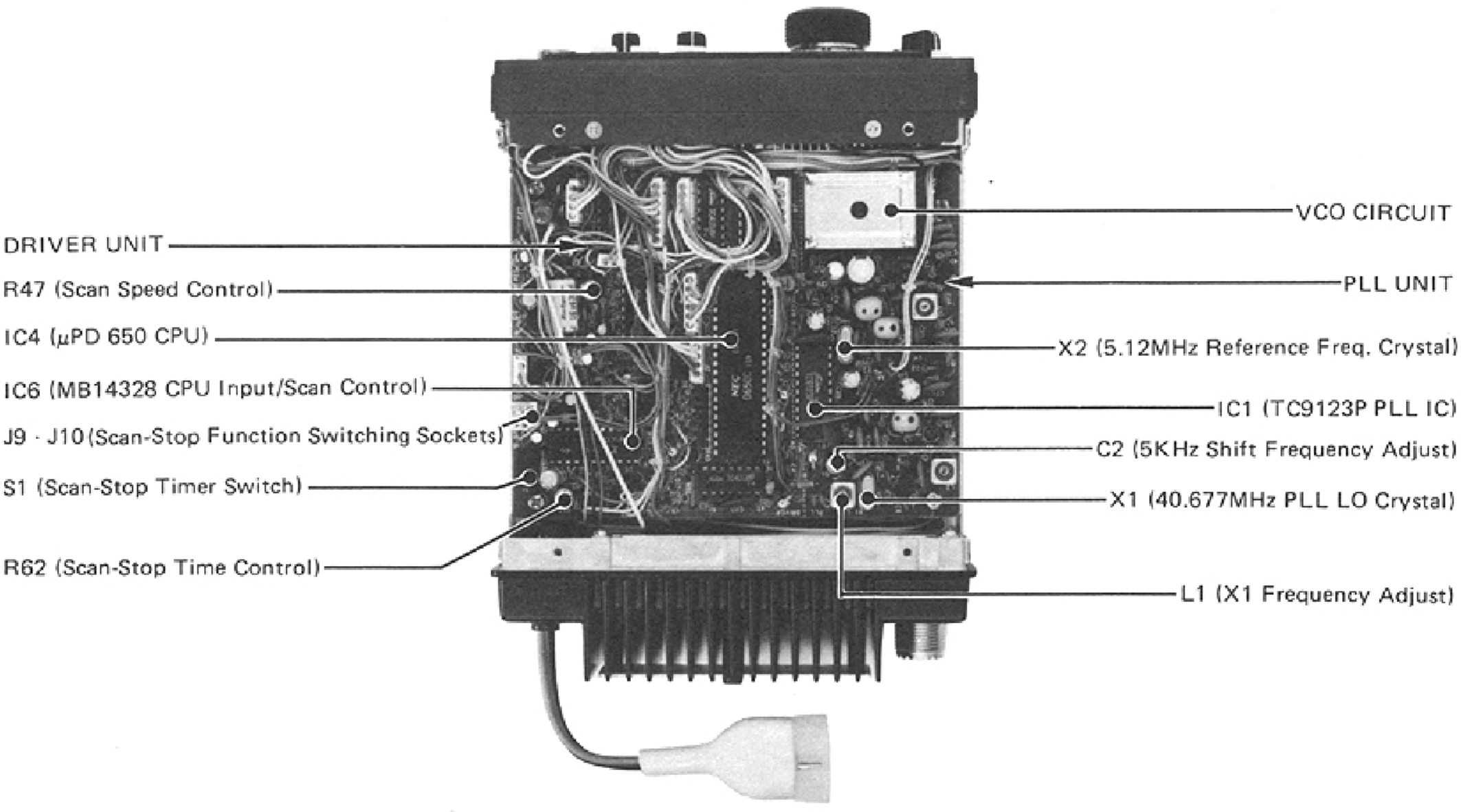
This control is used to set the scanning speed in any scan mode. Adjust it to the desired scanning speed.

INSIDE VIEWS

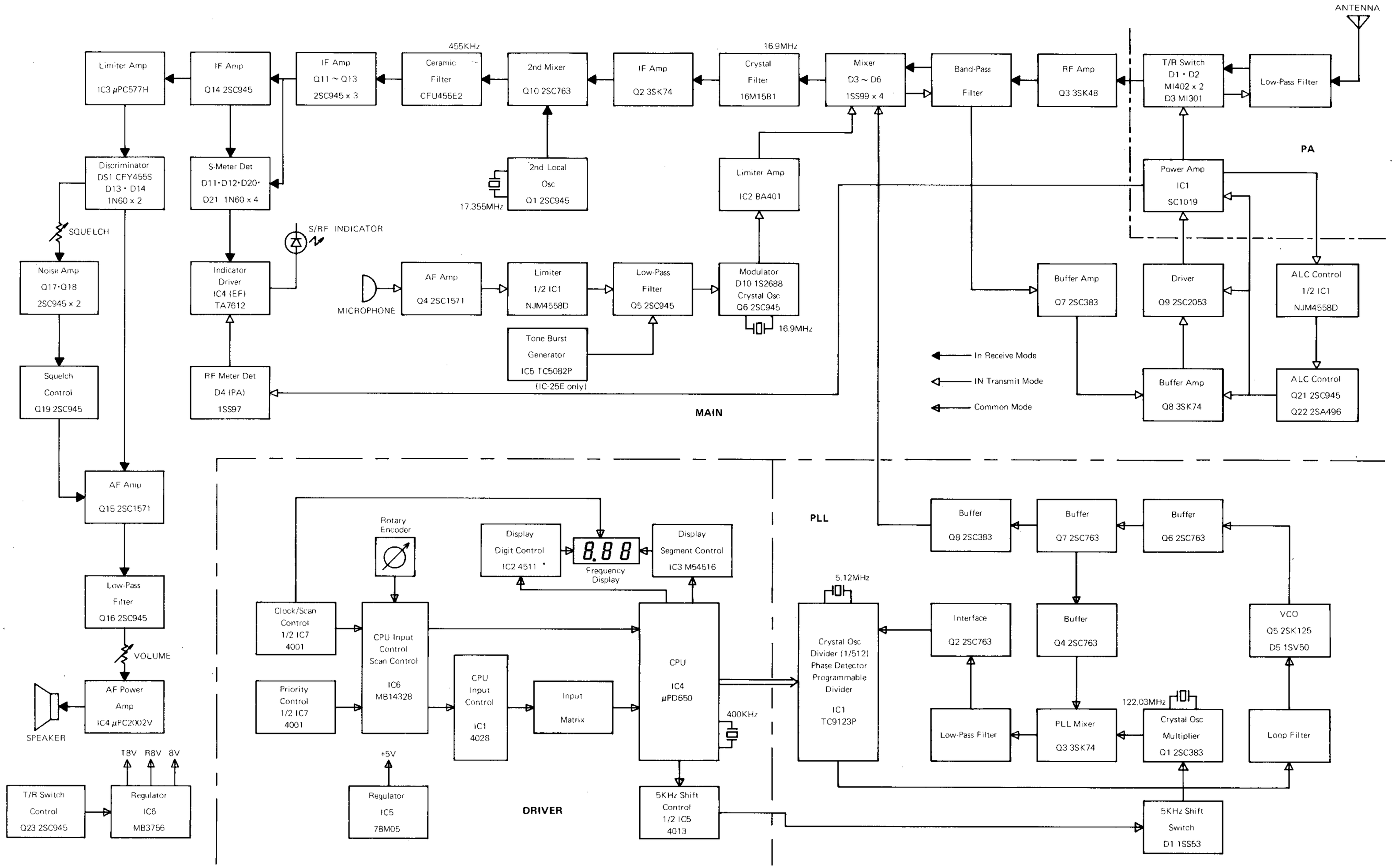
MAIN UNIT SIDE


F12 (CFU455E2 Ceramic Filter)
X1 (17.355MHz 2nd L.O. Crystal)
IC6 (MB3756 Regulator IC)
J6 (Internal Speaker Connector)
Q22 (2SA496 ALC Control)
DS1 (Ceramic Discriminator)
IC4 (μPC2002V AF Power Amp)
R123 (TX 25W Adjust)
R110 (RF Meter Adjust)
R116 (TX 1W Adjust)
R80 (S-Meter Adjust)
FI1 (16.9MHz Monolithic Crystal Filter)
Tone Burst Circuit (IC-25E only)
D3 ~ D6 · L4 · L5 (Double Balanced Mixer)
IC5 (TC5082 Tone Burst IC)
X3 (7.168MHz Tone Burst Crystal)
R100 (Tone Burst Level Adjust)
IC-25E only
X2 (16.9MHz TX OFFSET Crystal)
R36 (FM Deviation Adjust)
L6 ~ L9 (Helical Cavity Filter)
Q3 (3SK48 RF Amp FET)
J3
J2
C56 (Driver Output Trimmer)

PLL UNIT SIDE


DRIVER UNIT
R47 (Scan Speed Control)
IC4 (μPD 650 CPU)
IC6 (MB14328 CPU Input/Scan Control)
J9 · J10 (Scan-Stop Function Switching Sockets)
S1 (Scan-Stop Timer Switch)
R62 (Scan-Stop Time Control)
VCO CIRCUIT
PLL UNIT
X2 (5.12MHz Reference Freq. Crystal)
IC1 (TC9123P PLL IC)
C2 (5KHz Shift Frequency Adjust)
X1 (40.677MHz PLL LO Crystal)
L1 (X1 Frequency Adjust)

BLOCK DIAGRAM



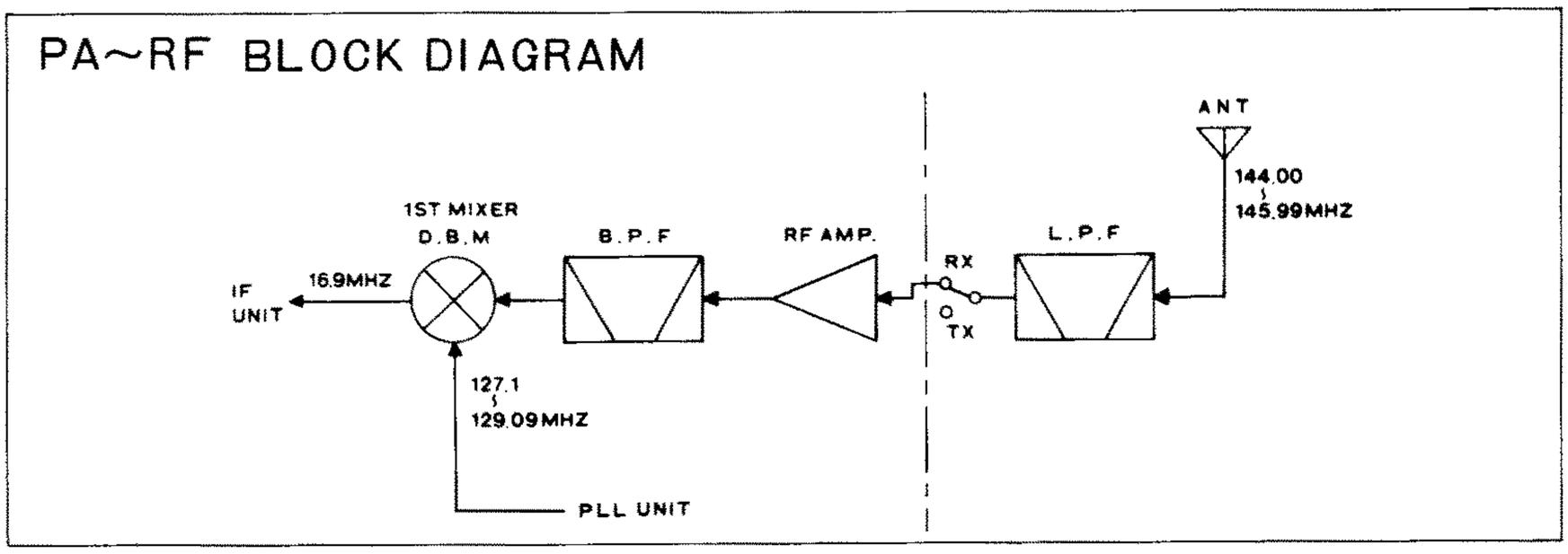
OPERATION

Model IC-25A/E is a 144-MHz FM transceiver composed of the main unit, PLL unit, driver unit, PA unit, etc.
Its fundamental circuitry is the double-conversion superheterodyne type, with a 1st IF of 16.9 MHz and a 2nd IF of 455 kHz. Frequency control is made by the microcomputer (incorporated in the driver unit) and the PLL unit which it controls.

1. Receiver

(1) PA unit

The PA unit is composed of the low-pass filter, T/R switching, power amplifier circuitry, etc.
The signal input from the antenna passes through the low-pass filter (consisting of L3 ~ L5 and C13 ~ C17), and is then led to the main unit RF circuitry after passing through a constant-K π-type filter (composed of C9, L2 and C5 by D3, which is ON only during reception).

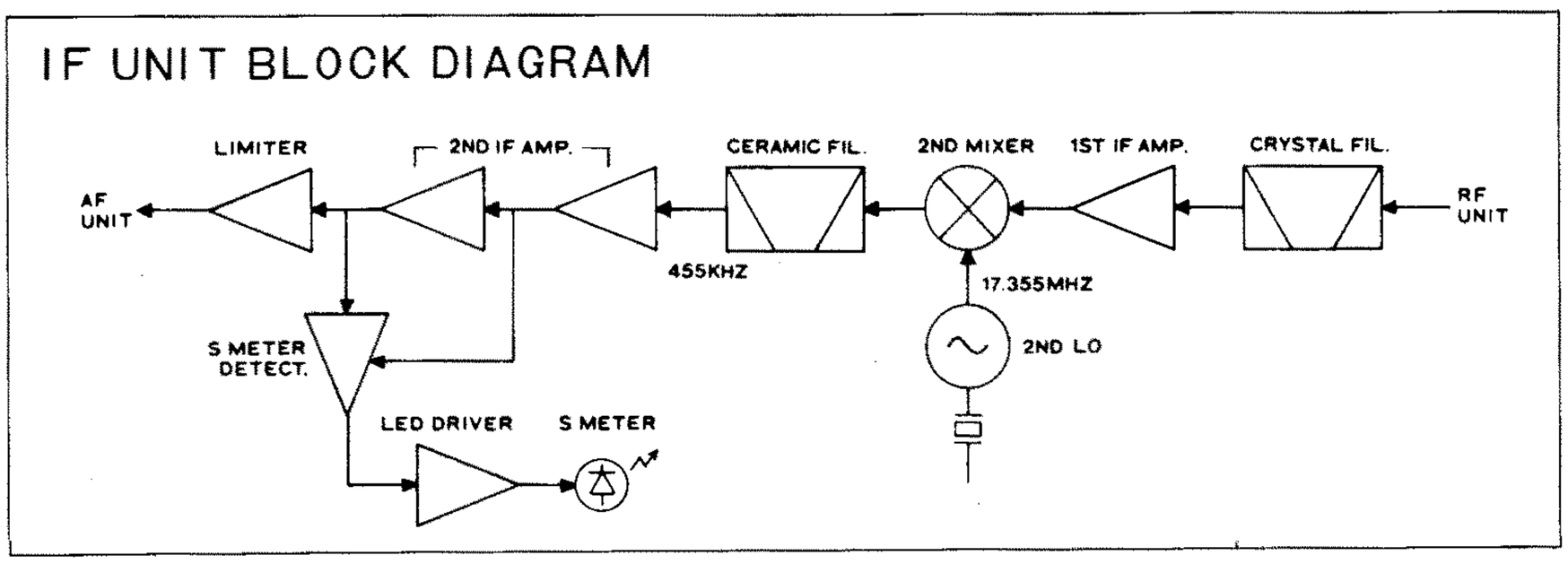


(2) Main unit (RF circuitry)

The RF unit is composed of RF amplifier, a band-pass filter, mixer circuitry, etc.
The receiving signal, which has passed from the PA unit through J2 is amplified by approximately 18 dB by MOS FET (3SK48) Q3, which features a low noise figure and intermodulation characteristics.
Unwanted signals are removed from the RF-amplified signal by the helical cavity band-pass filter (L6 ~ L9), after which the signal is input to the mixer circuitry of the next stage. This mixer circuitry features a wide dynamic range, and employs a double balanced mixer (DBM) composed of Schottky diodes (D3 ~ D6) which feature superb isolation between each port. The signal is mixed at this DBM with the 127 ~ 9-MHz signal input from the PLL unit, and converted to the first IF.

(3) Main unit (IF circuitry)

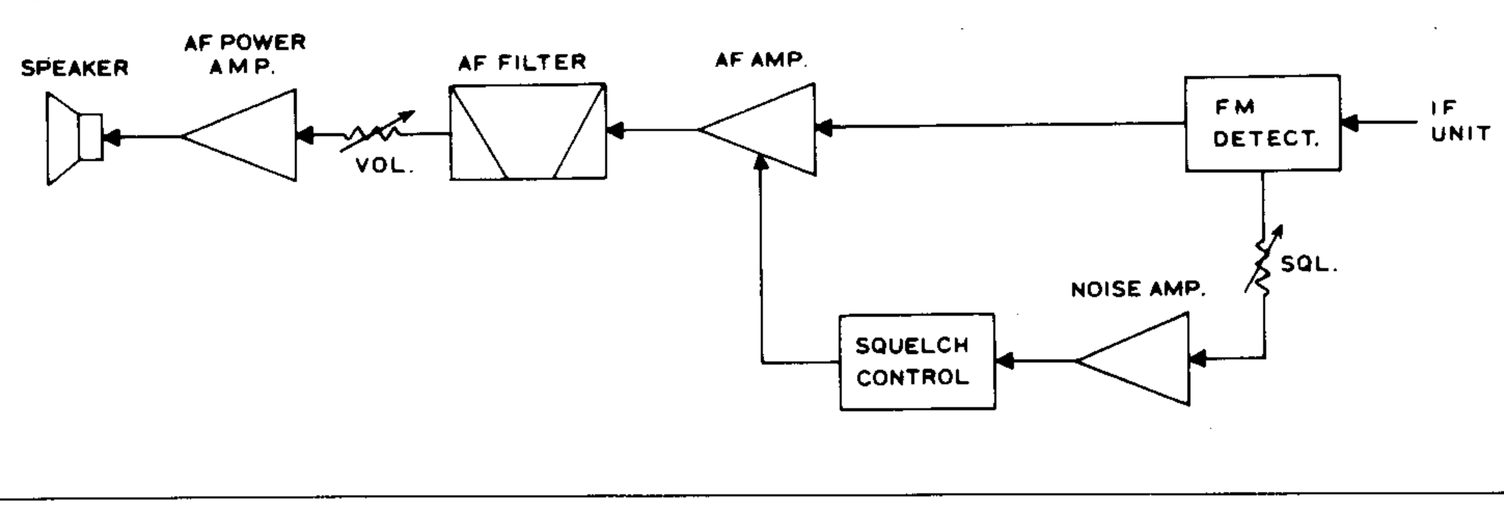
The IF unit is composed of a filter, the 1st IF amplifier, 2nd mixer, 2nd IF amplifiers circuitry, etc.
The crystal filter, which features superb selectivity, takes out only the wanted signals from the receiving signal of the RF unit after the signal has been frequency-converted by the DBM, and then, after amplification of approximately 20 dB by Q2, it is input to Q10 of the 2nd mixer circuitry.
The signal is then, at Q10, mixed with the 17.355-MHz signal oscillated by Q1, after which the 455-kHz 2nd IF signal is output. This signal output from the 2nd mixer passes through ceramic filter FI2, is IF-amplified by amplifier circuitry composed of Q11 ~ Q13, after which it passes through IC3 limiter-amplifier.



(4) Main unit (AF-amplification circuitry)

The AF-amplification unit is composed of circuitry for FM detection, AF amplification, AF power amplification, etc.
The signal input by limiter-amplifier IC3 is detected by the frequency-discrimination circuitry (composed of DS-1, D13, D14, R82 and R83), and is then de-emphasized at the integration circuitry (R85 and C78).
This signal is AF-amplified by Q15, passes through the low-pass filter formed by Q16, where unnecessary components are removed, and then, via the volume control, is amplified to the level which will drive the speaker by IC4 (for AF amplification), so that the speaker is thereby driven.

AF UNIT BLOCK DIAGRAM



(5) S-meter circuitry

In the S-meter circuitry, a weak signal passes from the L21 center tap and through C66 where it is taken out and rectified by D11 and D12. Because strong signals are detected by D20 and D21, the circuit has a wide dynamic range.

(6) Squelch circuitry

Signals detected by discriminator DS-1 pass through the squelch control, the noise component only is amplified by Q17, and then Q19 is switched as a result of D16 and D17 detection, and the Q15 (AF amplifier) is switched.

2. Transmitter

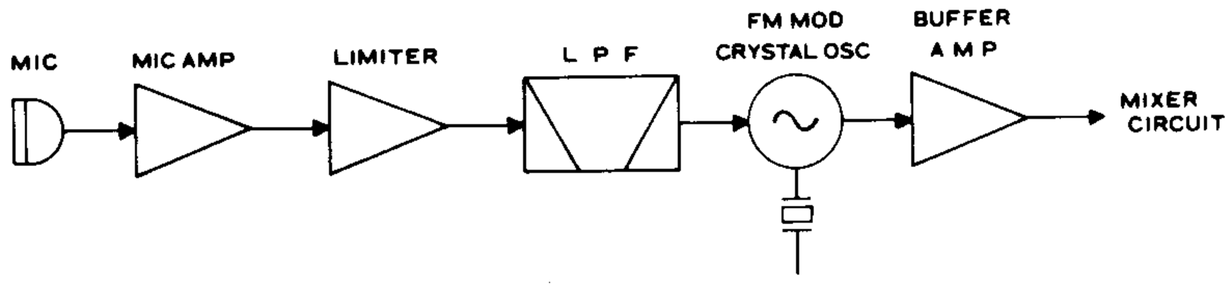
(1) Microphone amplification and modulation unit

This unit is composed of microphone amplifier, limiter-amplifier, FM modulation circuitry, etc.
Modulation is applied when 16.9 MHz is oscillated by X2 and Q6, and the output from Q5 is applied to varactor diode D10. Residual AM is removed from the modulated signal by IC2 (limiter amp.) In the next stage, after which the signal is input to the double balanced mixer (used also for reception) composed of Schottky diodes.

(2) Band-pass filter and Younger stage (YGR) unit

The signals mixed by the DBM pass through a band-pass filter (used also for reception) composed of L6 ~ L9, where nearby spurious signals are removed.
Signals which have passed through this filter are applied, via T/R switch D7, to Q7.
Next, they are amplified by the YGR unit (composed of Q7, Q8 and Q9), and are power-amplified to the PA module drive level (200mW).

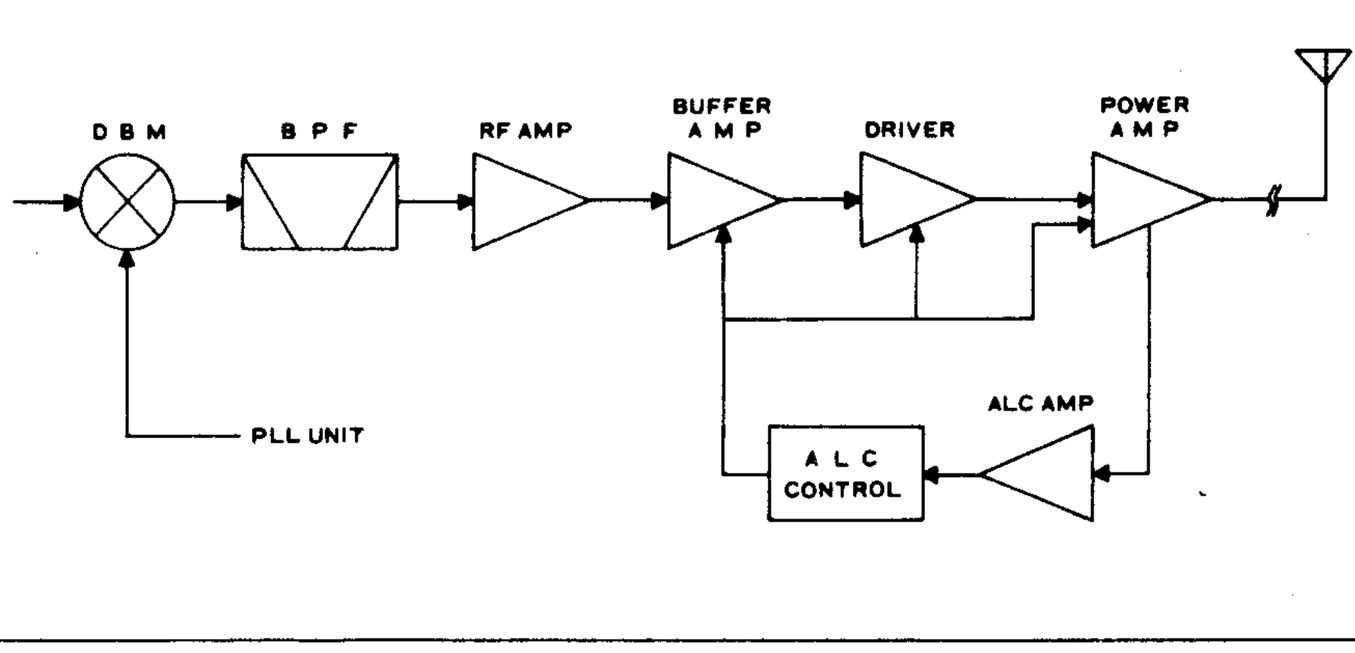
MIC AMP~MOD. BLOCK DIAGRAM



(3) PA unit

Input signals from the YGR unit are amplified to approximately 25W by the PA module IC1 (SC1019), after which they pass, via D1 and D2 (ON during transmission), through the resonance circuitry (composed of C9 and L2). The low-pass filter (composed of L3 ~ L5 and C13 ~ C17), with Chebyshev characteristics, suppresses spurious signals by approximating the maximum attenuation points to the second and third harmonics, after which the transmission signal is supplied to the antenna's circuitry.

MIXER~PA BLOCK DIAGRAM



(4) ALC unit

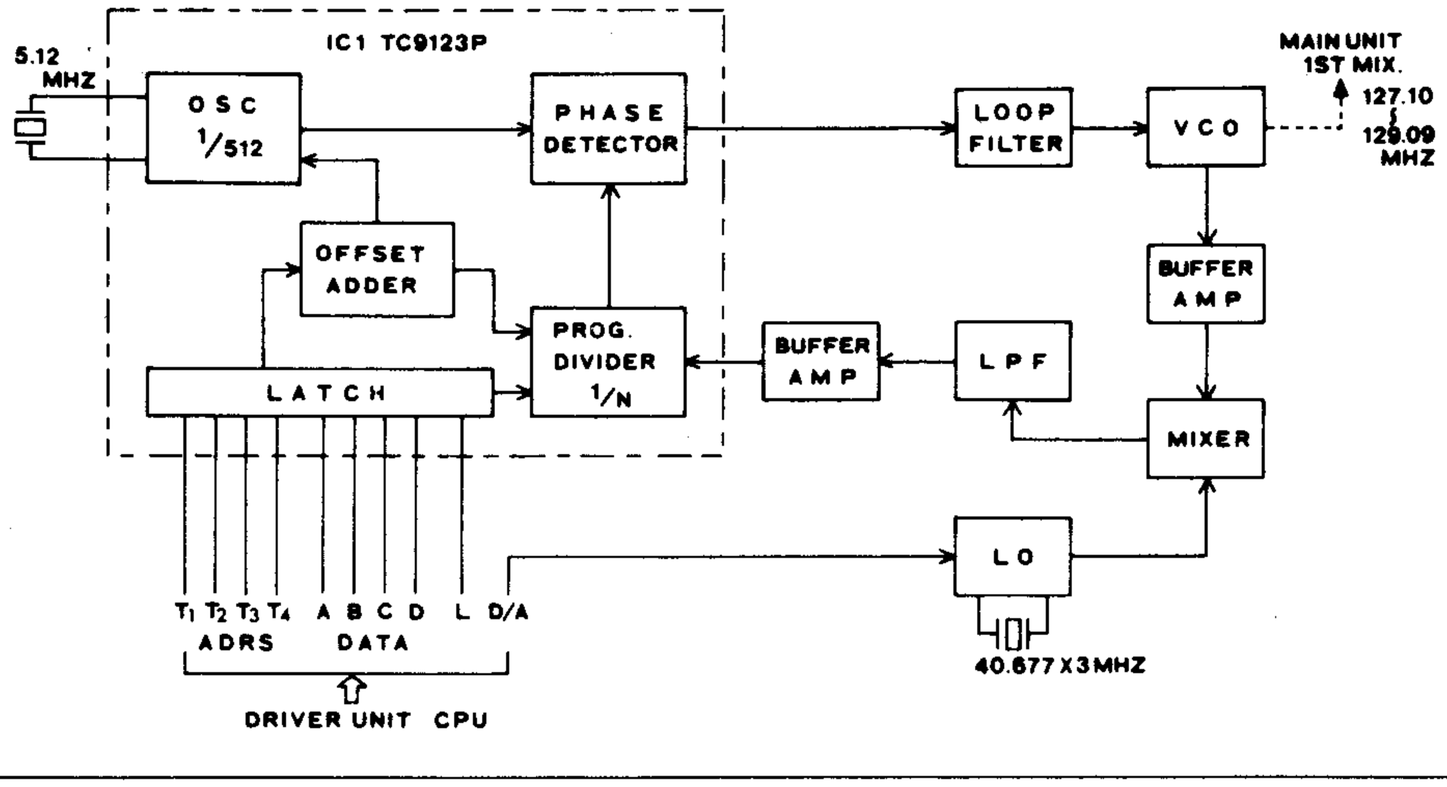
The final-stage current of the PA section is detected as a result of the R1 voltage drop, and is input to IC1 (pin 5) of the main unit. In addition, HV line is applied to pin 6 of IC1, so that the operation voltage of the excitation amplifier (Q8 and Q9) and PA module IC1 is thereby controlled by IC1, Q21 and Q22.

(5) Power-supply unit

The power-supply circuitry IC6 is a voltage regulator IC (MB3756) to assure a stable voltage supply. An input of 13.8V is input from pin 2, and a regulated 8.2V is supplied to +8V (pin 1), R8V (pin 6) and T8V (pin 8) lines. Note that Q23 is, by stand-by muting, the IC6 control transistor.

3. PLL unit

PLL UNIT BLOCK DIAGRAM



The PLL unit of this model is mixed-down PLL circuitry controlled by the CPU of the driver unit. A frequency of 40.677 MHz is oscillated in the local-oscillator circuitry, and a frequency of 122.03 MHz (40.677 x 3) is obtained. The VCO is locked at each 10-kHz interval through the PLL frequency range of 127.10 ~ 129.09 MHz.

(1) Local-oscillator circuitry

The oscillation frequency of the local-oscillator circuitry is obtained according to the following formula:

fo: VCO output frequency
fm: local-oscillator frequency
N: programmable divider divisions (see table 1)
fi: reference frequency (10 kHz)

(1) Converted to the formula:

$$fm = fo - Nfi \quad \text{——— (2)}$$

For a carrier frequency of 144 MHz, the VCO output frequency fo:

$$fo = 144\ (MHz) - 16.9\ (MHz) = 127.1\ (MHz)$$

* 16.9 MHz is the first IF frequency

(2) Which is expressed as:

$$fm = 127.1\ (MHz) - 507 \times 10\ (kHz)$$
$$= 127.1\ (MHz) - 5.07\ (MHz)$$
$$= 122.03\ (MHz)$$

By the above, then, the local-oscillator frequency becomes 122.03 MHz at 144 MHz. The frequency oscillated by X1 and Q1 is tripled and tuned by the tuning circuitry consisting of C8 and L2, with the result that X1 (VCO crystal) oscillates a frequency of 40.676 MHz (122.03 ÷ 3).

Table 1

Freq. (MHz)	CPU output	Division N
144.00	400	507
144.01	401	508
⋮	⋮	⋮
144.99	499	606
145.00	500	607
145.01	501	608
⋮	⋮	⋮
145.99	599	706
⋮	⋮	⋮
147.00	700	807
⋮	⋮	⋮
148.00	800	907

(2) PLL mixer circuitry

A high-gain, low-noise dual-gate MOS FET is employed in mixer Q3, thereby reducing local-oscillation leakage.

Only the difference component is taken out by low-pass filter (composed of L3, C13 and C14) in the next stage. This signal is then amplified by Q2 to the level at which the programmable divider is enabled, and is then input to IC1 (pin 12).

(3) Reference frequency oscillation division, phase comparison and programmable divider

IC1 is a multi-function IC which incorporates the above functions in one package.

The reference frequency of 10 kHz oscillates 5.12 MHz by the crystal attached at IC1 (pins 20 and 21), and by a frequency division of 1/512, an accurate reference signal of 10 kHz is obtained.

Digital phase comparison of this reference signal and the signal which has been mixed-down by the PLL mixer circuitry and frequency-divided by the frequency division N of the programmable divider is made by the phase comparator, and the result is output to pin 16.

As for the programmable divider input, the frequency data (BCD code) output from the CPU goes to the A ~ D terminals (pins 6 ~ 9), the digit-assigned data is prepared for T1 ~ T3 (pins 2 ~ 4), and the readout is performed, according to the timing of the load enable pulse (L terminal), in the order beginnig from the most-significant digit.

Note that, because the counter offset of this IC is +107, the frequency and divider frequency division N become just as shown in table 1.

(4) Loop filter circuitry

The phase comparator output, taken from pin 16 of IC1, pulses in accordance with the phase difference, and, for that reason, the harmonic component and noise component are removed, together with DC conversion, as the signal passes through the lag-lead filter (composed of R26, R27, R28, C28, C29 and C31). When the output voltage is rapidly changed by a large value by jumping the frequency from the upper to lower band edges or vice versa, D3 or D4 is turned ON and the output signal does not pass through R26, and C29 is charged directly, with the result that response becomes quicker.
In addition, so that there will be response to the positive and negative pulses from the phase comparator, each is attached at reverse polarity. And, in constant operation, D3 and D4 are OFF, and the loop filter width is narrow, so that there is little influence by surrouding noise, etc.

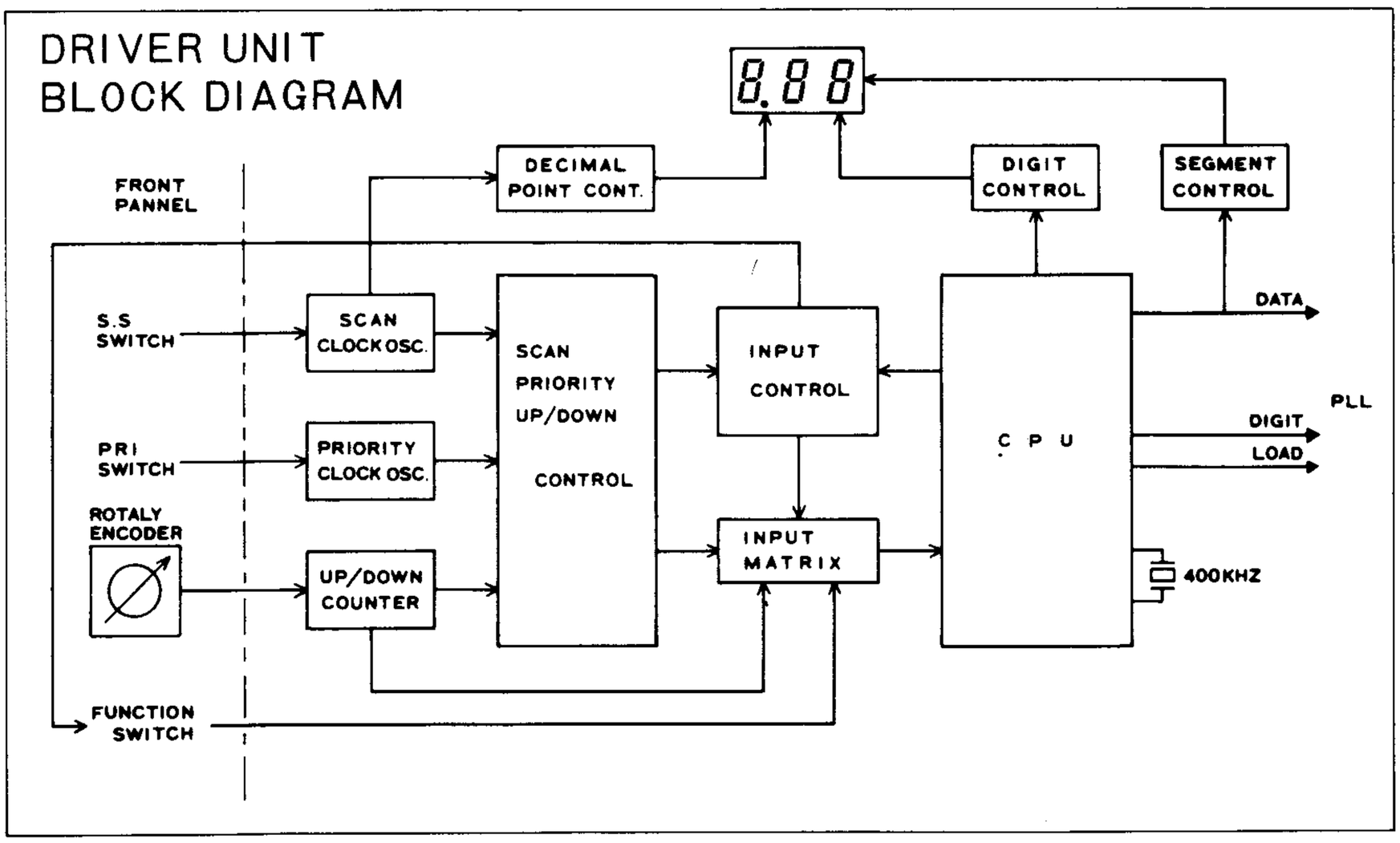
(5) VCO and buffer-amplification circuitry

The voltage changed to DC by the loop filter is supplied to varactor diode D5 of VCO circuitry, and is subjected to control the oscillation frequency. This VCO is a Colpitts type of oscillation circuitry consisting of Q5 and a tuned circuit, and the signal is buffer-amplified by Q6 and Q7 in the next stage. Because the VCO output is used as the 1st local oscillator signal for transmission and reception, the impedance is matched with DBM, and the signal is amplified until the conversion loss of DBM is minimized by Q8.
In addition, the output taken from the center tap of L10 passes through isolation amplifier Q4, and is injected at the second gate of Q3 PLL mixer, thereby reducing leakage from the PLL local oscillator.

(6) Transmission muting circuitry

When the lock is unlocked, pin 18 of IC1 becomes ground level. By taking advantage of this, unwanted waves are prevented by stopping T8V of the main unit from being applied.

4. Driver unit



The driver unit, the CPU, as the main device, is composed of circuitry for CPU input control, input matrix, display, etc.
The up/down and clock signals obtained from the rotary encoder (directly coupled to the tuning control knob on the front panel) are sent in order to the CPU. These signals are handled at the CPU according to the program, and display data and frequency control data are sent to the frequency display and the PLL unit.

Main functions of logic unit IC's transistors and diodes

IC1	Conversion of BCD code to 10 digits; Q output
IC2	For display; BCD code conversion to 7-segment code
IC3	Transistor array; display digit control
IC4	CPU
IC5	CPU reset
IC6	Input control; control of sensor data, mic up/down data, timer, priority, scan, etc.
IC7	2 input NOR x 4; unstable multi-vibrator for priority and scanning
IC8	INV x 6; control of busy/unused, VFO5, etc.
Q1 & Q2	Memory scan ⟷ full/prog. scan switching
Q4	Power ON (CPU)
Q5	For memory read
Q6	For priority release at VFO
Q7	For priority start at memory ch.
Q8	For auto-stop during priority operation
Q9	For scan speed reduction during memory ch.
Q10	For scan clock and sensor input
Q12	For control of CK and UD (IC6 output)
Q13	For timer
Q14	For S power supply
Q15 & Q19	For decimal point flashing during scanning
Q16 & Q17	For 5V during VFO operation
D1 & D4	Memory ⟷ full/prog. scan switching
D1, D3 & D6	For voltage drop prevention
D9 & D10	For offset frequency setting during initial operation
D14	For priority auto-stop
D24	For decimal point flashing during scanning
D27	1 count when scan stops
D32 & D33	For load reduction during initial operation
D34	For prevention of latch-up
D36	For band setting during initial operation

Operation of logic unit IC6 (MB14025)

This IC is a custom LS type TTL, with ICOM's own unique circuitry in a 22-pin plastic package. Its main functions are the scan and input controls and interface for IC4 (CPU).

This IC controls each operation by the clock input to pin 14 (STM).

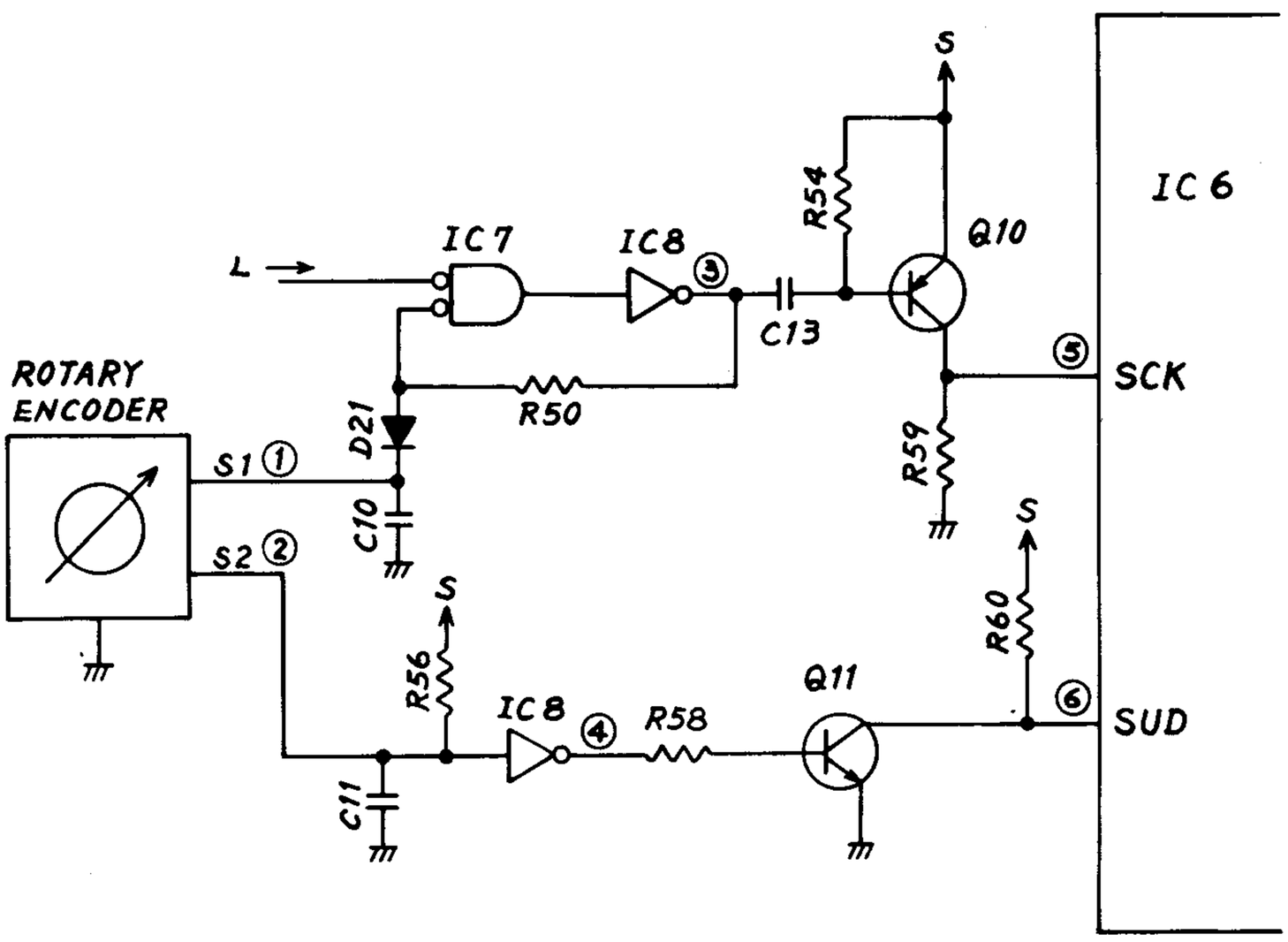
Pin	Name	Operation
1.	N.C.	Not used
2.	N.C.	Not used
3.	SUD	Sensor data up/down and scan input control
4.	SCK	Sensor data count and scan input control
5.	SCO	Output of S/S input (pin 8)
6.	MSL	For reset
7.	MCL	For reset
8.	S/S	S/S switch input
9.	RSW	Internal latch input
10.	SEL	Timer ON/OFF input
11.	GND	Ground
12.	BUSY	Used as ground
13.	SQL	Squelch input
14.	STM	Custom clock input
15.	ITI	Timer input
16.	ITO	Timer output
17.	RIC	Internal latch output
18.	RLD	For PRIO LED
19.	RCK	Control of up (pin 20) and CK (pin 21)
20.	UD	SUD output
21.	CK	SCK output
22.	+Vcc	Power supply (+4.5 ~ 5.5 V)

(1) Up/down, scan and external up/down control circuitry

The signals (data) generated by operation of the tuning control knob, the scan start/stop button, microphone scan, etc., pass through the pulse-generation circuitry (consisting of IC7, IC8, Q9, Q10 and Q11), the waveform-shaping circuitry, and the A/D conversion circuitry, and are then input to the input control TTL IC (IC6), developed by ICOM with its own unique program written in.
AT IC6, these input data are quickly and precisely fed to the CPU.

Frequency up/down circuitry

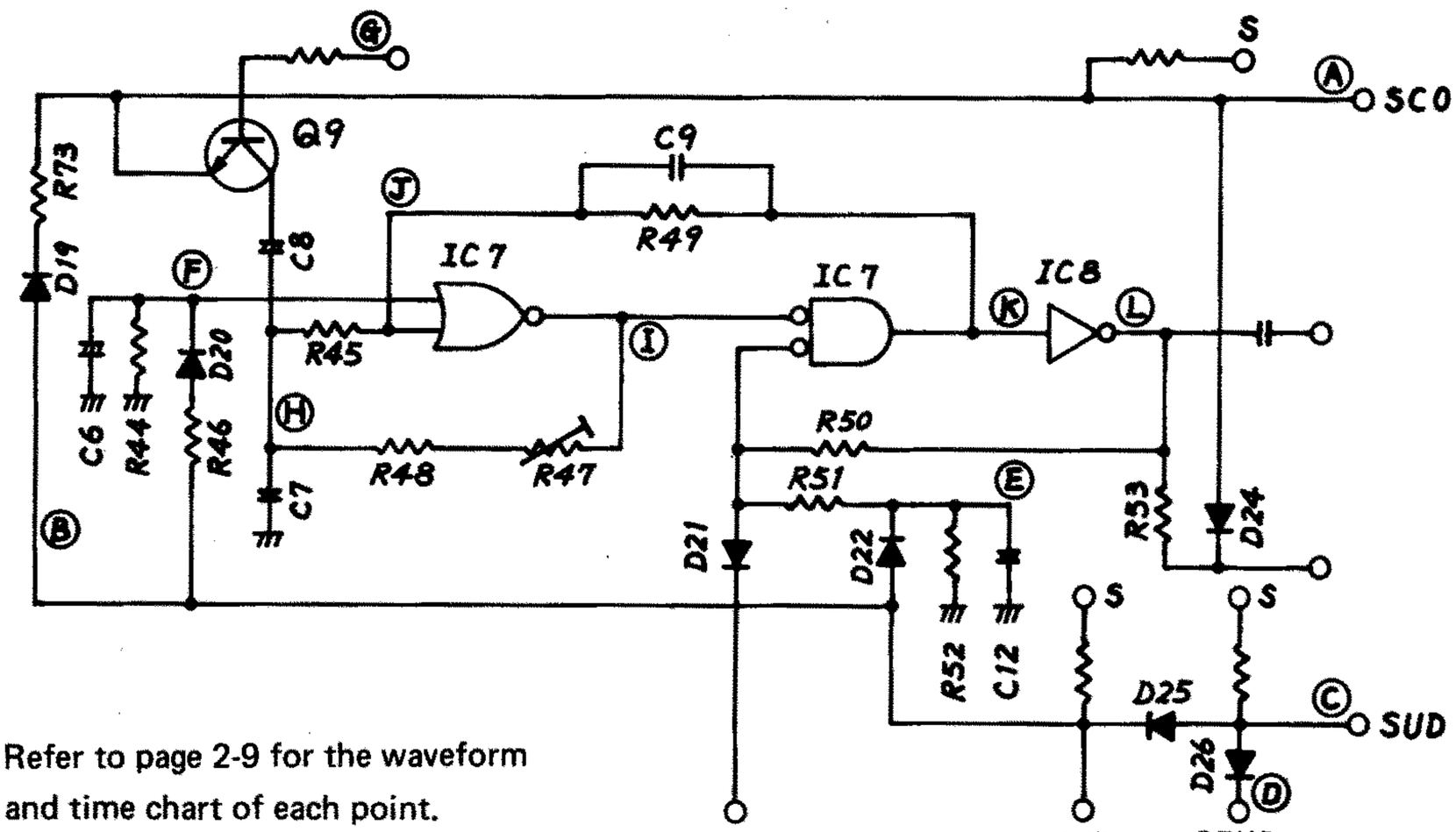
By turning the tuning control knob clockwise or counterclockwise, signal S1 (for counting the frequency), and signal S2 (up or down) which distinguishes the turning direction are generated at the rotary encoder. S1 and S2 have a 90° phase difference, so that S2 is advanced from S1 when the tuning control is turned to the right, and is delayed when it is turned to the left.
The S1 signal (1) is integrated by the rotary encoder's internal resistor (approx. 600Ω) and C10, and then, after removing contact chattering, it is formed into a perfectly square wave by the Schmitt circuitry (consisting of IC7 and IC8), is differentiated at (3) C13 and R54, and is input to the IC6 SCK with a pulse width of 1.5 to 2μS. An addition (if the tuning control was turned to the right) or subtraction (if turned to the left) of an initialized 5 kHz or 25 kHz (IC-25A: 15 kHz) occurs for each pulse input at the SCK.
The S2 signal, which makes addition or subtraction, is integrated by the encoder's internal resistor and C11, and then, after chattering has been removed, the signal (4) is input at SUD (6) IC6.
When the S1 pulse is input to the SCK, the action will be an addition (up) if SUD (S2 pulse) is H level, or subtraction (down) if the pulse is L level.



- **Microphone up/down and scan control circuitry**

The voltage of SCO is reduced when the scan start/stop button is pressed, and because the voltages of (F) and (E) are reduced as a result, the multi-vibrator (IC7) oscillates. At this time, SUD becomes the H level according to the voltage across R73 and the junction voltage of D19 and D25, and the down-scan action is activated. Because the time-constants of C6 and R44 and of C12 and R52 differ, continuous scan starts after the first count of one.

As for memory scan, the scan speed becomes slower because C7 and C8 are in parallel. Note that R47 is the control for adjustment of scan speed.
Microphone up/down is accomplished in the same way. When it is up, only the junction voltage of D25 is applied to the SUD terminal, and, when it is down, a voltage divided by R60 and 470Ω (H-level) is applied to the SUD.
D26 is a diode which stops the scan operation during transmission. Actually, microphone up-scanning only is possible during transmission.



* Refer to page 2-9 for the waveform and time chart of each point.

Priority-control circuitry

When the power is turned on, IC6's RSW, RIC and RLD become H level. When the VFO/MEMORY CHANNEL switch is set to the VFO position, the Q7 base becomes L level, causing Q7 to switch OFF, so that RSW will not become L level even if the priority button is pressed.

When the VFO/MEMORY CHANNEL switch is set to a memory channel (1 ~ 5), Q7 is switched ON, and when the priority button is pressed once, an L pulse enters RSW, and the priority circuitry becomes ON. In this condition, both RIC and RLD become L level.

When RIC becomes L level, the IC7 (A) and (B) oscillation circuitry operates.

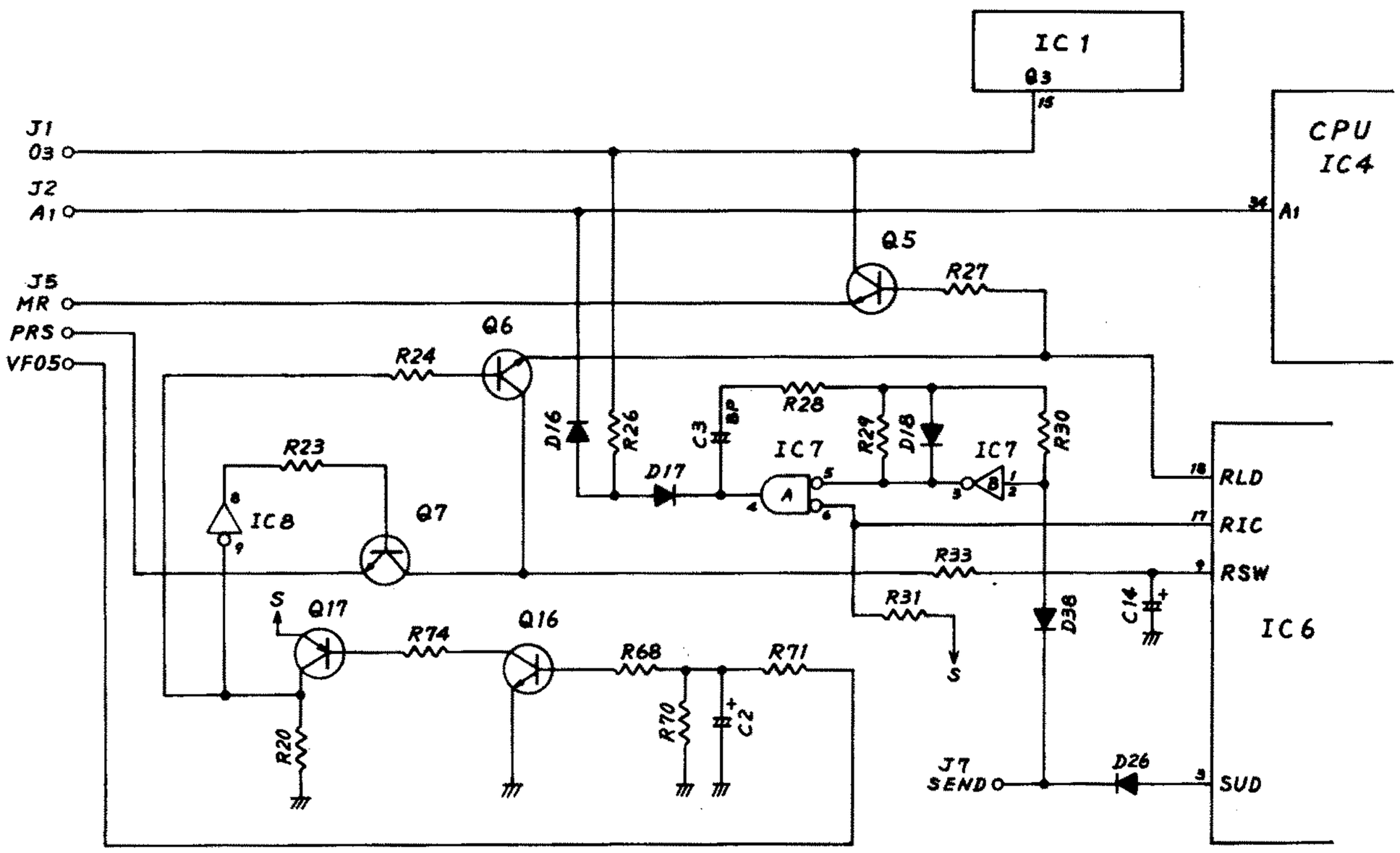
When RLD is L level, Q5 is switched OFF, and, unless pin 4 of IC7 becomes H level, the condition is of VFO A or B.

When pin 4 of IC7 becomes H level, the flow in the input matrix (consisting of R26 and D16) becomes $Q_3 \rightarrow A_1$, and the designated memory read-out occurs.

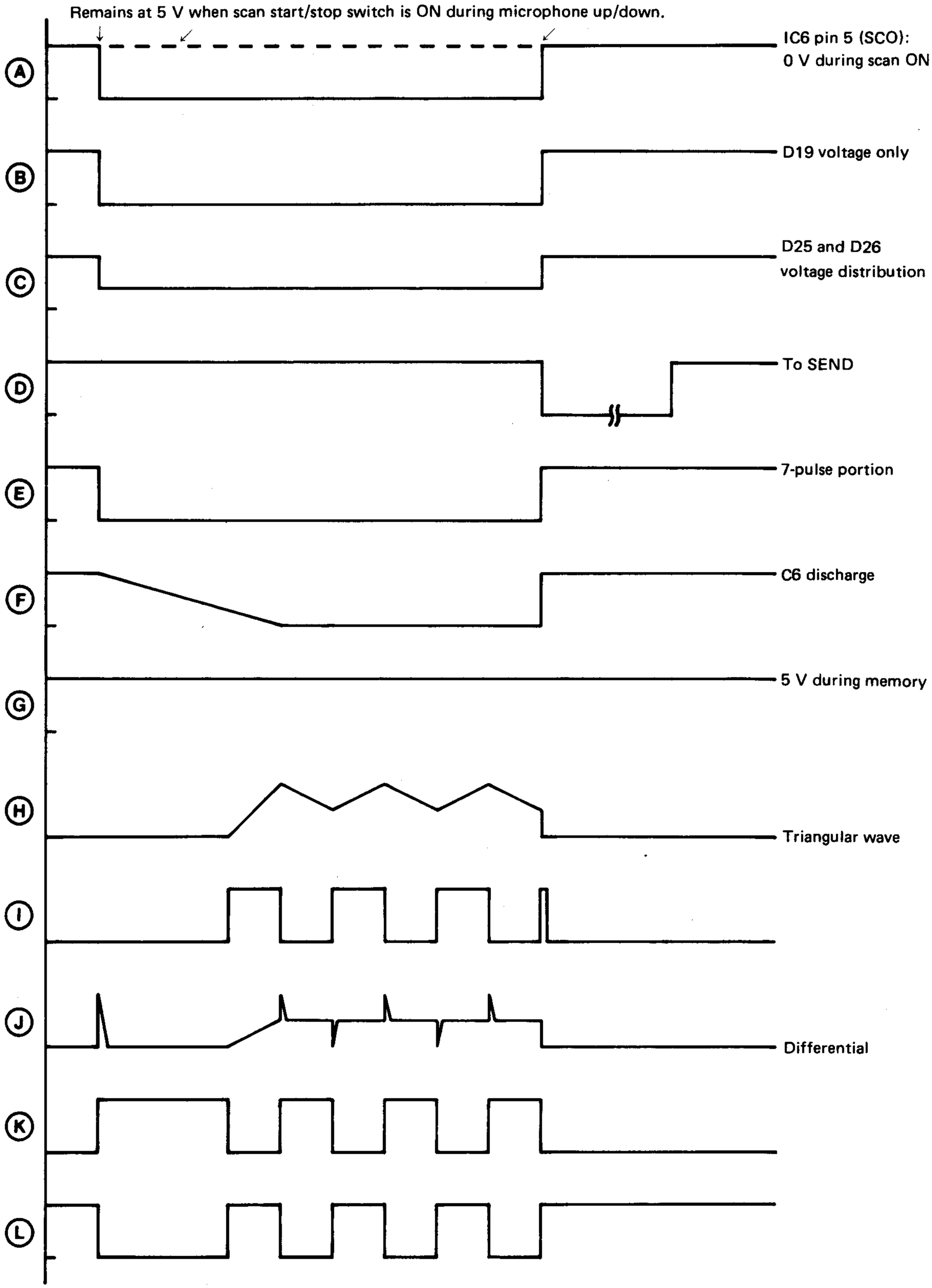
When transmission occurs during the priority condition, SUD is changed to L level by D26, and, as a result, RIC becomes H level. As a consequence, the oscillation of IC7 (A) and (B) stops, and pin 4 of IC7 becomes L level. However, because the level of RLD is maintained even during a condition of oscillation, the priority LED remains illuminated.

When the unit changes back to reception, RIC becomes L level, and IC7 (A) and (B) again resume their oscillation.

When, during the priority condition, the VFO/MEMORY CHANNEL switch is switched from the memory channel to VFO, the Q6 base changes from L level to H level, so that RSW is changed to L level by Q6, and the priority condition is released.

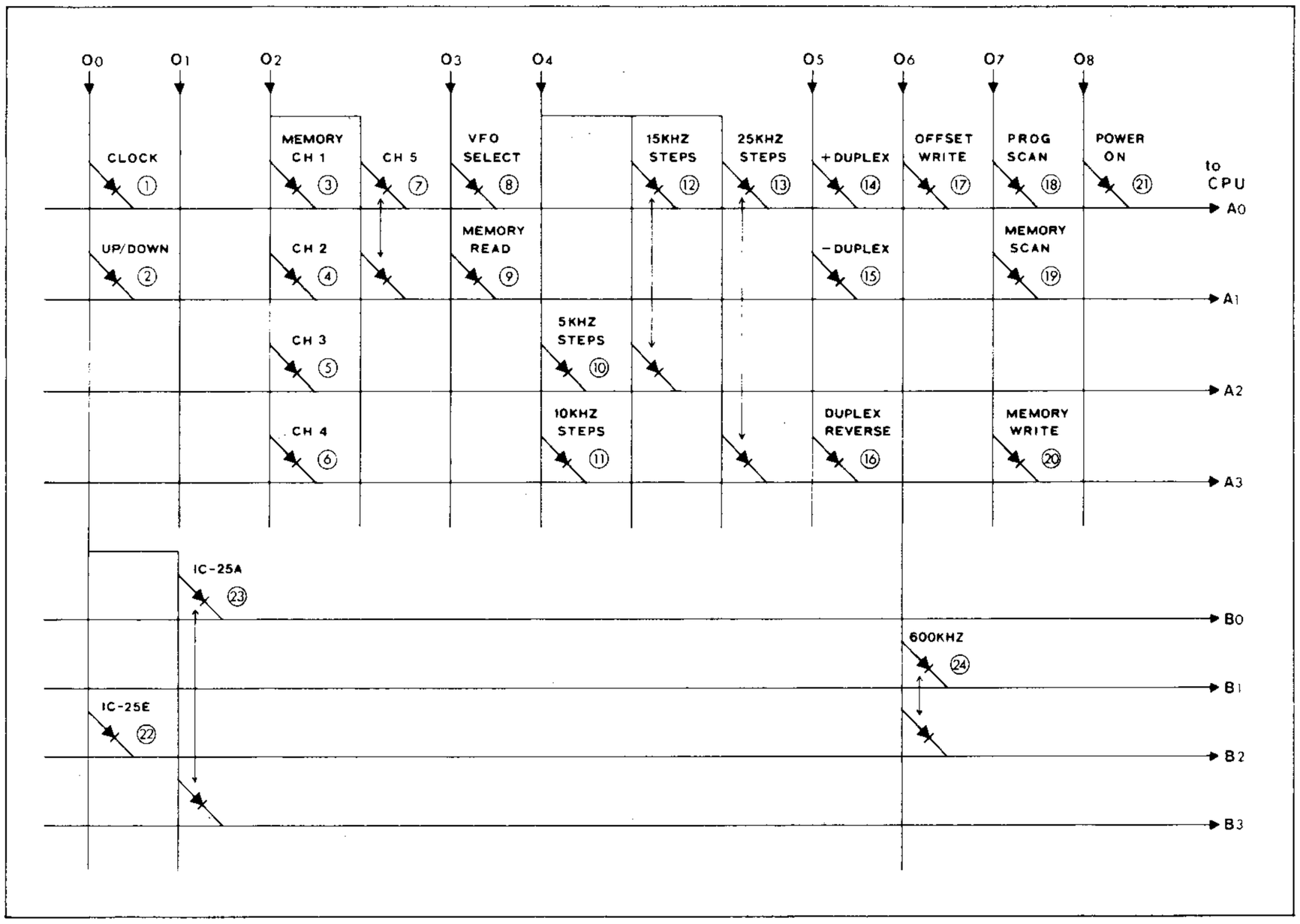


Scan operation when scan start/stop switch is ON



(2) CPU input-control and matrix circuitry

In order for the CPU to catch the various input data activated by the switches and buttons on the front panel, others for up/down and scan, input matrix circuitry and IC1 for input control are incorporated. Input data pass through this circuitry and are input to the CPU. When, however, there are many input data, the 4-bit configuration limits discrimination to 16, so that data discrimination is performed by a time-sharing operation by a timing pulse (Q0 ~ Q8) sent out from IC1 as data pass through input-control IC6.



(1) O0 → A0 (Clock)
This flow occurs when the frequency is moved up or down with each pulse input by turning the tuning control knob or scanning.

(2) O0 → A1 (Up/Down)
This flow occurs when the frequency is moved up. When the frequency is moved down, the O0 signal is not fed to A1.

(3) O2 → A0 (Memory Channel 1)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at "1".

(4) O2 → A1 (Memory Channel 2)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at "2".

(5) O2 → A2 (Memory Channel 3)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at "3".

(6) O2 → A3 (Memory Channel 4)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at "4".

(7) O2 → A0, A1 (Memory Channel 5)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at "5".

(8) O3 → A0 (VFO Select)
This flow occurs when the VFO Switch is set in "B", and the unit operates at the frequency set by "B" VFO. When the VFO Switch is set in "A", the O3 signal is not fed to A0, and the unit operates at the frequency set by "A" VFO.

(9) O3 → A1 (Memory Read)
This flow occurs when the VFO/MEMORY CHANNEL Switch is set at a memory channel, and the set operates on the channel. This function is prior to the function (8).

(10) O4 → A2 (5KHz Steps)
This flow occurs when the VFO Switch is set at "A", and the operating frequency is moved up or down with 5KHz steps.

(11) O4 → A3 (10KHz Steps)
When this flow occurs, the operating frequency is moved up or down with 10KHz steps.
(This mode is not used for IC-25A/E.)

(12) O4 → A0, A2 (15KHz Steps)
When this flow occurs, the operating frequency is moved up or down with 15KHz steps.
(This mode is used for VFO B of IC-25A.)

(13) O4 → A0, A3 (25KHz Steps)
When this flow occurs, the operating frequency is moved up or down with 25KHz steps.
(This mode is used for VFO B of IC-25E.)

(14) O5 → A0 (+Duplex)
This flow occurs when the OFFSET Switch is set at "+", and the transmit frequency becomes a frequency which is added the specified offset frequency to the receive frequency.
(This mode is not used for IC-25E.)

(15) O5 → A1 (–Duplex)
This flow occurs when the OFFSET Switch is set at "–", and the transmit frequency becomes a frequency which is subtracted the specified offset frequency from the receive frequency.
(This mode is preset for IC-25E.)

(16) O5 → A3 (Duplex Reverse)
This flow occurs when the OFFSET Switch is set at "+", or "–" and the DUPLEX MODE Switch is in "REV" position, the receive frequency becomes a frequency which is added to, the specified offset frequency or subtracted it from the original receive frequency, and the transmit frequency becomes the original receive frequency.

NOTE: In the duplex operation, if an expecting transmit frequency becomes out of the band, this frequency will remain at the original receive frequency.

(17) O6 → A0 (Offset Write)
This flow occurs when the VFO/MEMORY CHANNEL is set at "VFO" position and the PRIORITY button is pushed, and the offset frequency can be reset by turning the tuning control knob.

(18) O7 → A0 (Programmed Scan)
When this flow occurs, and the S/S button is depressed, the operating frequency scans between frequencies written into the Memory Channels 1 and 2. (Memory Channel 2 should be written higher frequency than Memory Channel 1, if not the scan function does not actuate.)
When this flow does not occur and the S/S button is depressed, the operating frequency scans the entire band.

(19) O7 → A1 (Memory Scan)
When this flow occurs, the operating frequency scans on the memory channels and the VFO's A and B.

(20) O7 → A3 (Memory Write)
When a memory channel is selected and this flow occurs, a frequency of the VFO A is written into the selected memory channel.
When a VFO is selected and this flow occurs, a frequency of the other VFO is written into the selected VFO.

(21) O8 → A0 (Power ON)
This flow occurs when the POWER Switch is turned ON. When this flow does not occur, the CPU is in stand by condition.

NOTE: The port B is used to initialize the CPU when the power is turned ON.

(22) O0 → B2
When this flow occurs, the operating frequency range is selected between 144.000MHz and 145.995MHz. (This mode is used for IC-25E.)

(23) O0 → B0, B3
When this flow occurs, the operating frequency range is selected between 143.800MHz and 148.195MHz. (This mode is used for IC-25A.)

(24) O6 → B1, B2
When this flow occurs, the offset frequency is preset for 600KHz.

(3) CPU and output

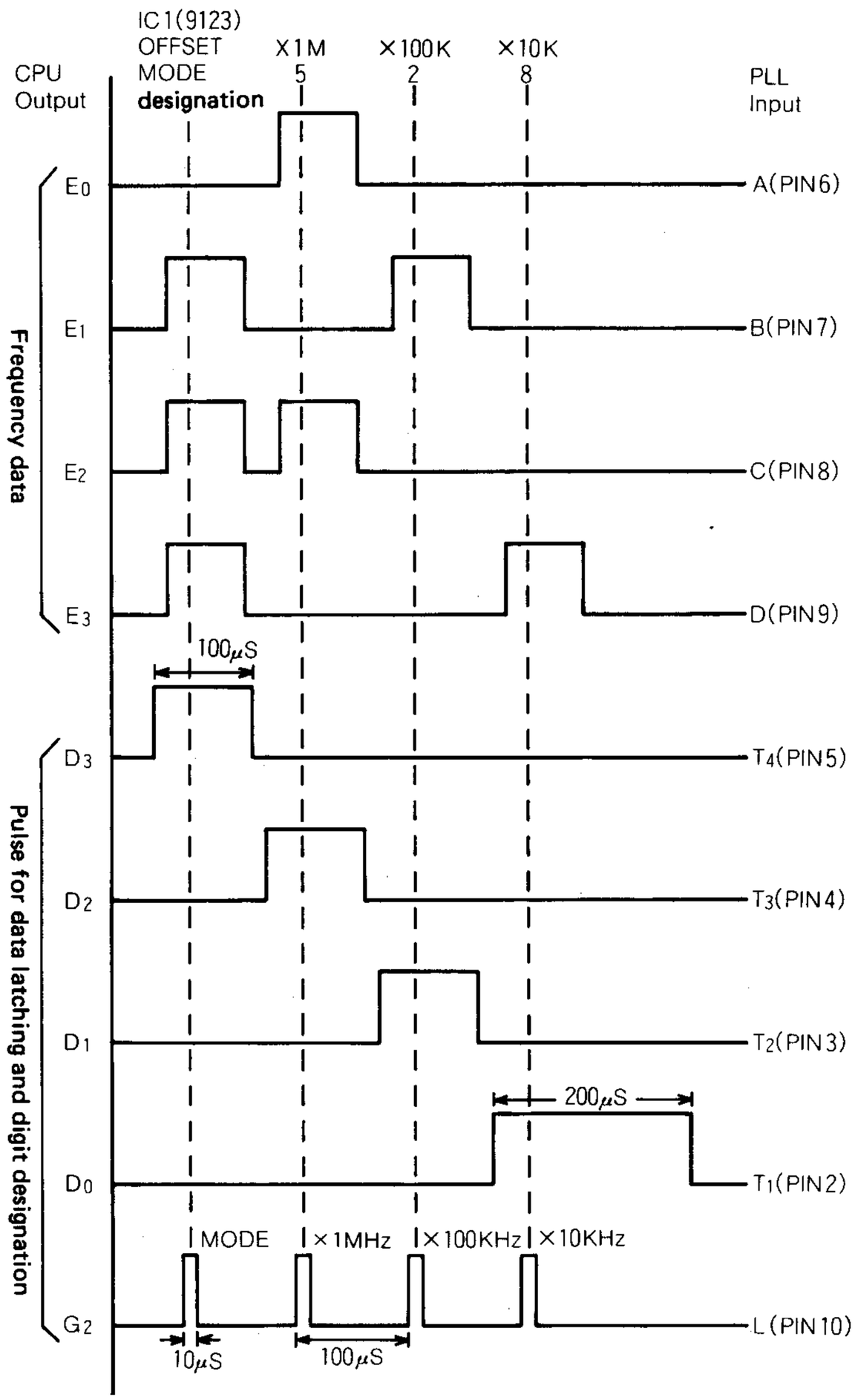
The CPU performs several operations depending on the programs written into it: initial setting, memorization, calculation, and output processing. The data input from terminals A0 ~ A3 and B0 ~ B3 are instantaneously processed according to the program. The data are then output from output terminals E0 ~ E3, F0 ~ F3 and D0 ~ D3, and the individual data are then sent on to frequency display and PLL unit. The data output from terminals F0 ~ F3 are the frequency data, and are displayed, via IC2 (for display drive), on the display. These data are also sent to IC1 (A ~ D terminals) of the PLL unit, there becoming the PLL frequency data. IC2 converts the CPU output data to character display segment (a ~ g) data, and tranfers the data to the display. IC3, based upon the data output from F0 ~ F2 of the CPU, designates the display digits.

The output data from D0 ~ D3 are sent to IC1 of the PLL unit, and are there used to designate the frequency digits. Note that the following time chart should be used as reference concerning the relationship between the F0 ~ F3 and D0 ~ D3 output and the PLL.

CPU → PLL frequency data transfer time chart

- Frequency data are sent from E0 ~ E3 of the CPU to terminals A ~ D of IC1 (TC9123P) of the PLL.
- The digit signal to the PLL is output from D0 ~ D3 of the CPU, and is input at T1 ~ T4 of the PLL IC1.
- Load pulses are sent out one after another from G2 of the CPU, and the data are latched according to the timing of the pulses.

Example: FM 145.280MHz



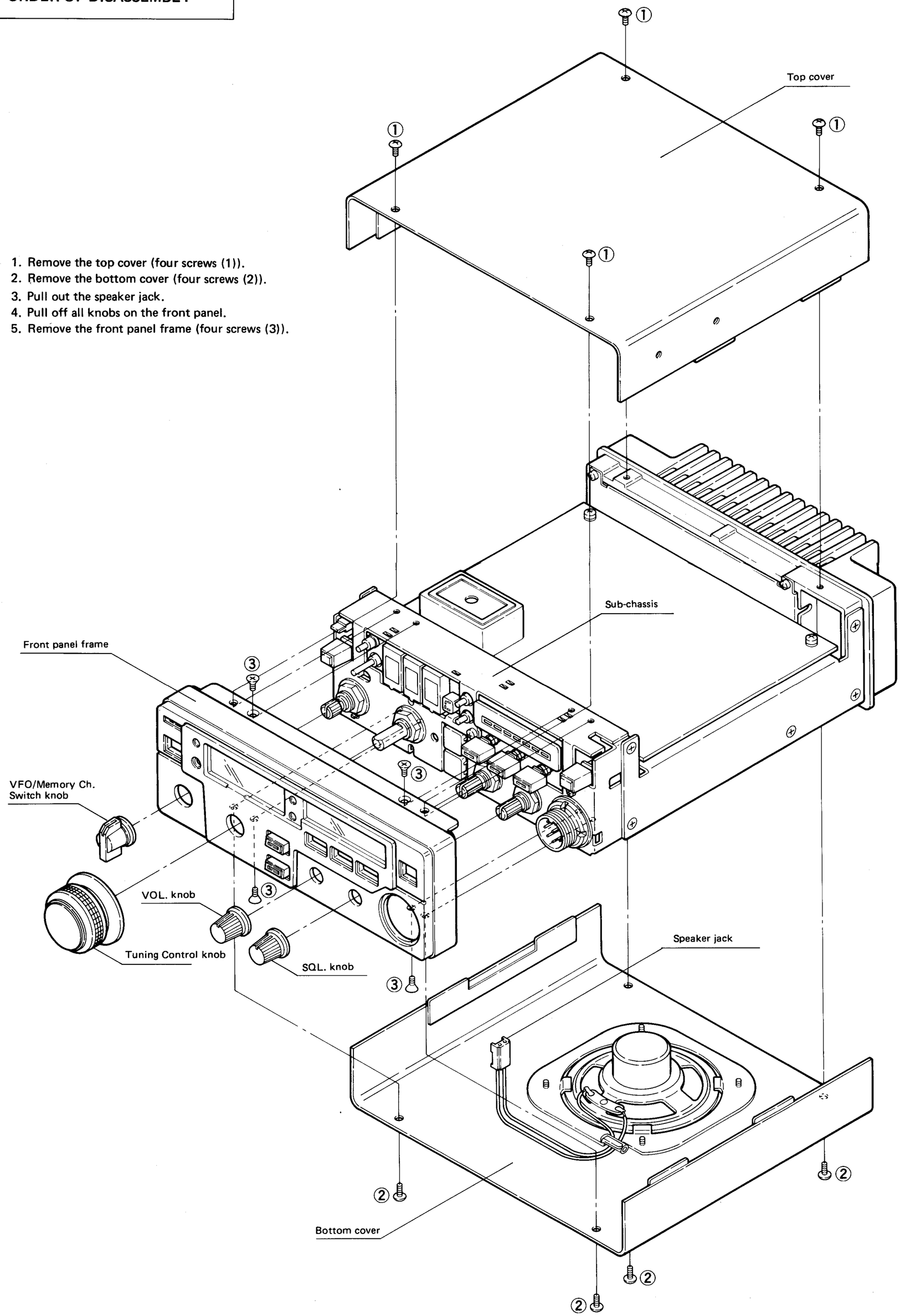
Logic unit IC's

The IC's used in the logic unit are TTL (IC6 only) and C-MOS (except IC6).
Because it is difficult to check with a tester each part which operates digitally because of the pulse signals, it is very important to know the operation timing of each part, and to know the H or L level operation points.
The IC threshold voltages are as follows:

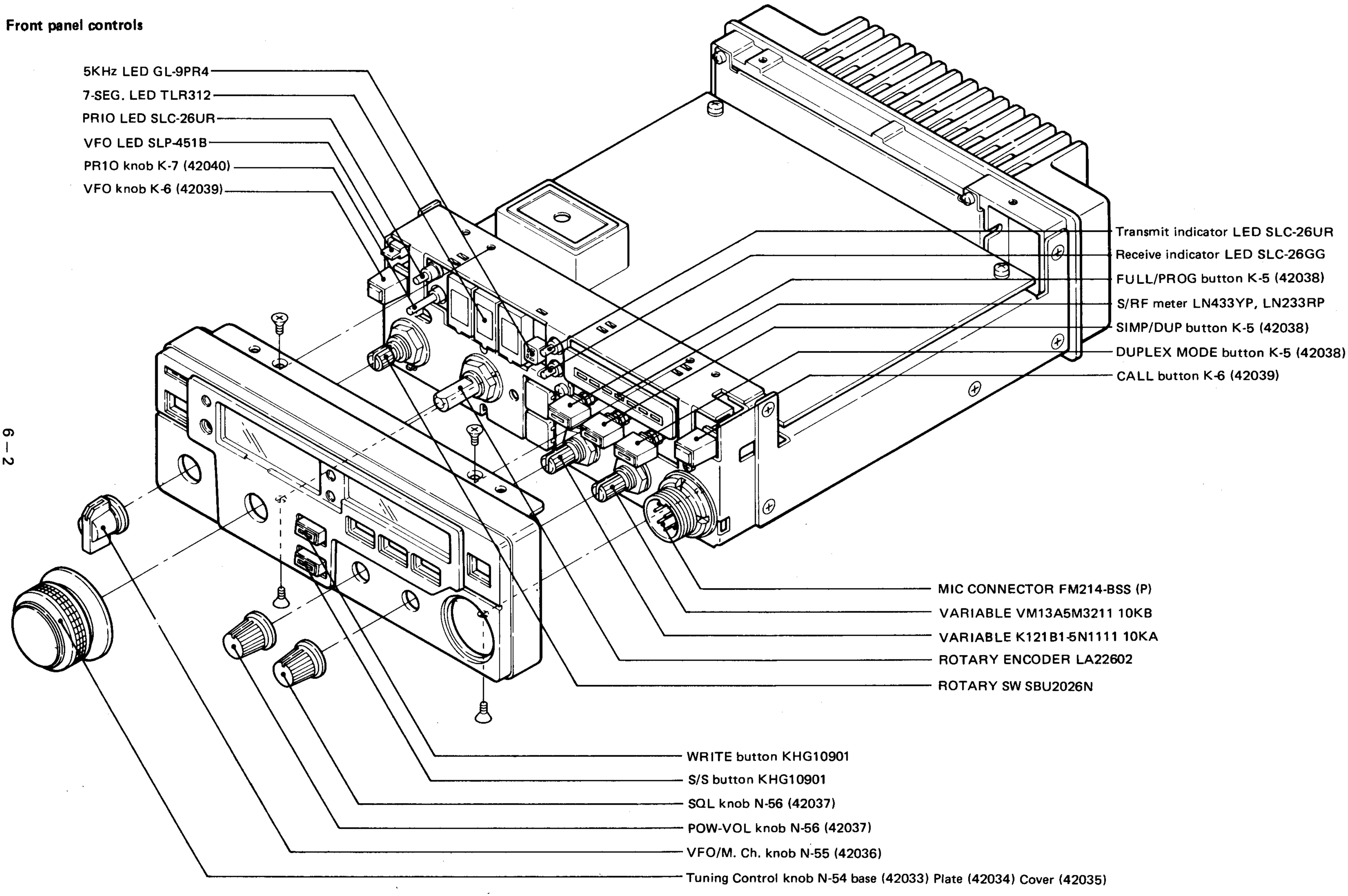
IC6 (TTL)	Vcc: 5V
Threshold:	1.5V
L level input (max.):	0.8V
H level input (min.):	2.0V
Except IC6 (C-MOS)	VDD: 5V
Threshold:	2.5V
L level input (max.):	1.5V
H level input (min.):	3.5V

ORDER OF DISASSEMBLY

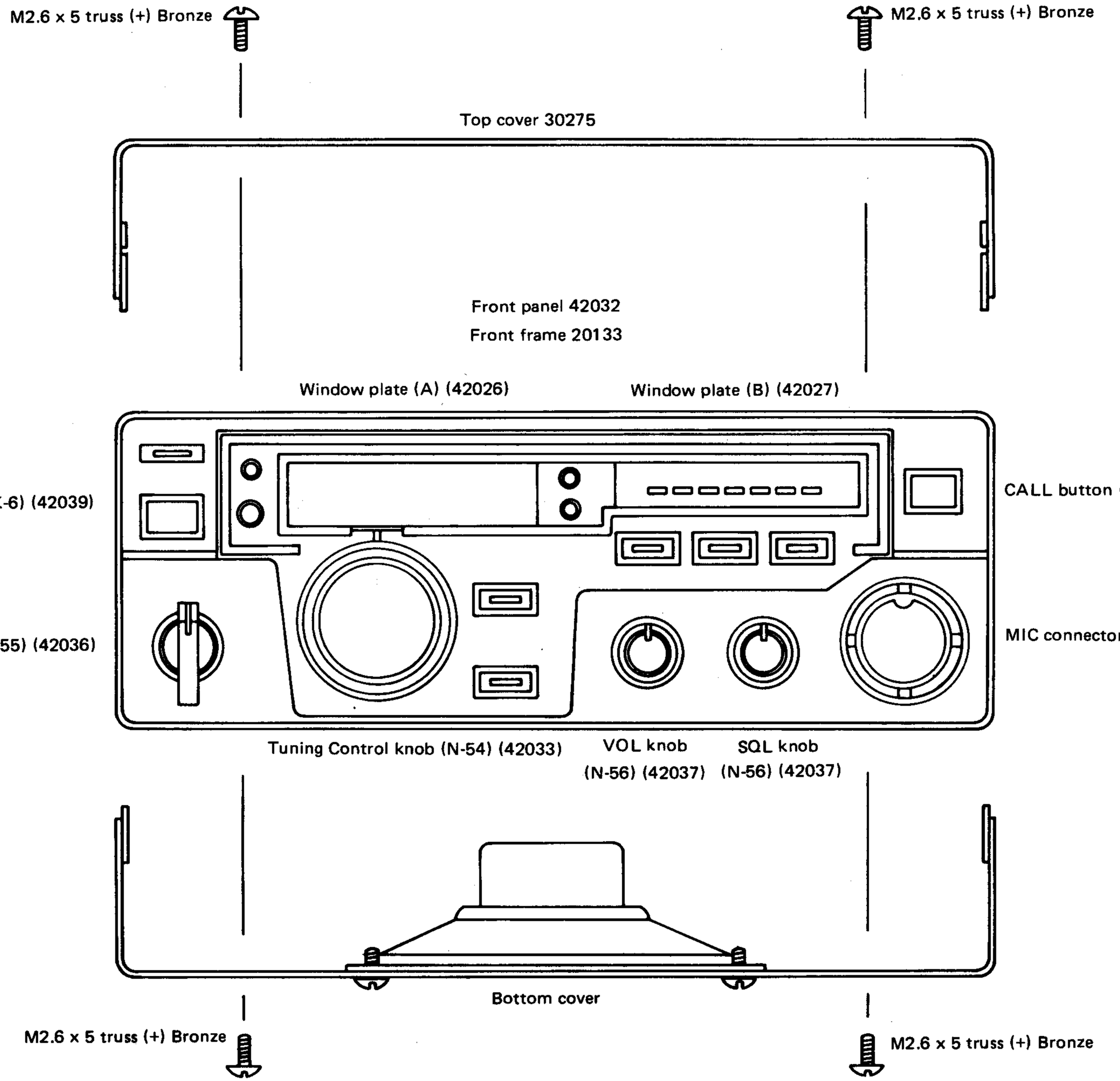
1. Remove the top cover (four screws (1)).
2. Remove the bottom cover (four screws (2)).
3. Pull out the speaker jack.
4. Pull off all knobs on the front panel.
5. Remove the front panel frame (four screws (3)).



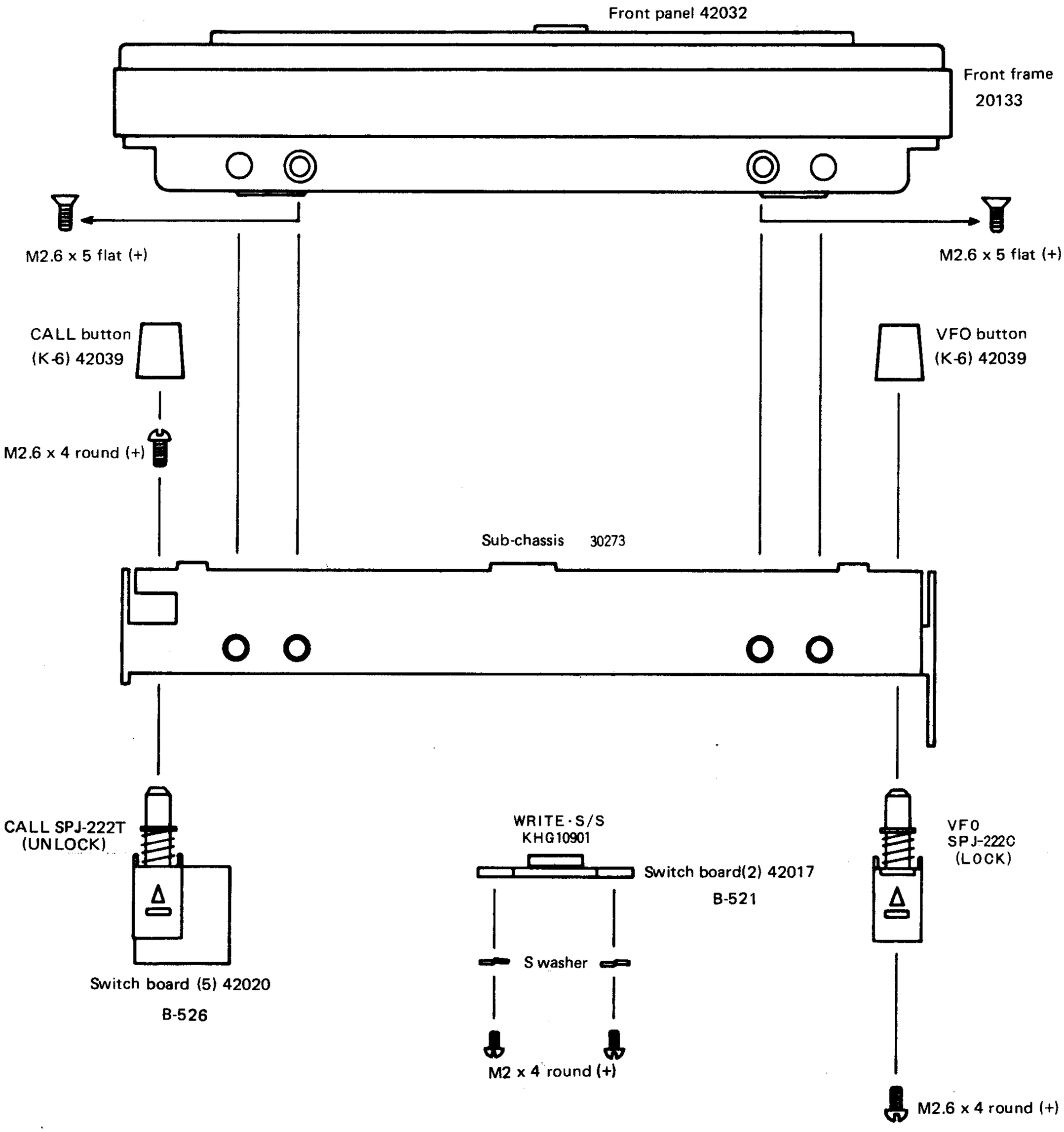
Front panel controls



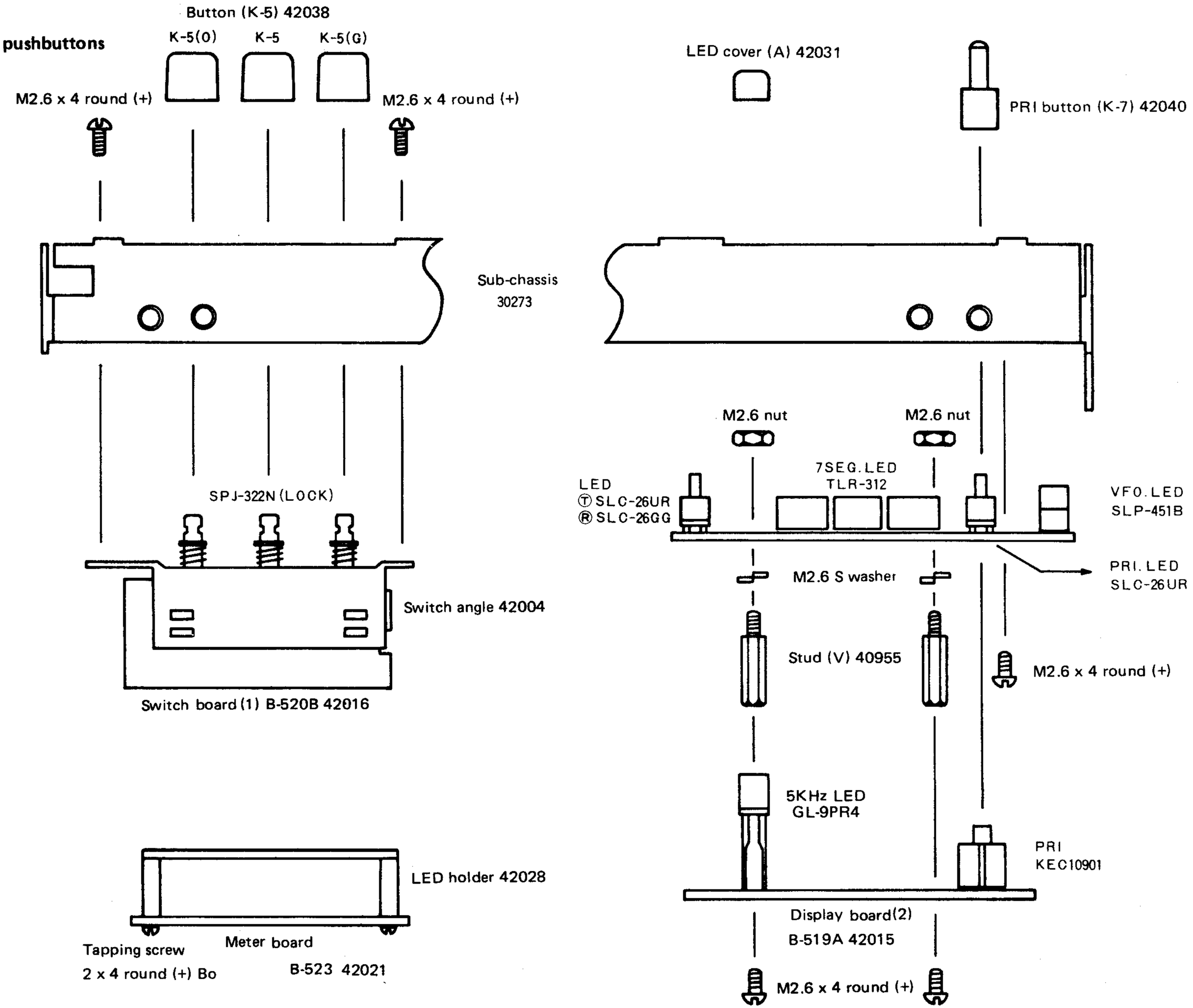
Front panel controls


M2.6 x 5 truss (+) Bronze
M2.6 x 5 truss (+) Bronze
Top cover 30275
Front panel 42032
Front frame 20133
Window plate (A) (42026)
Window plate (B) (42027)
VFO button (K-6) (42039)
CALL button (K-6) (42039)
VFO/M. Ch knob (N-55) (42036)
MIC connector FM214-8SS(P)
Tuning Control knob (N-54) (42033)
VOL knob (N-56) (42037)
SQL knob (N-56) (42037)
Bottom cover
M2.6 x 5 truss (+) Bronze
M2.6 x 5 truss (+) Bronze

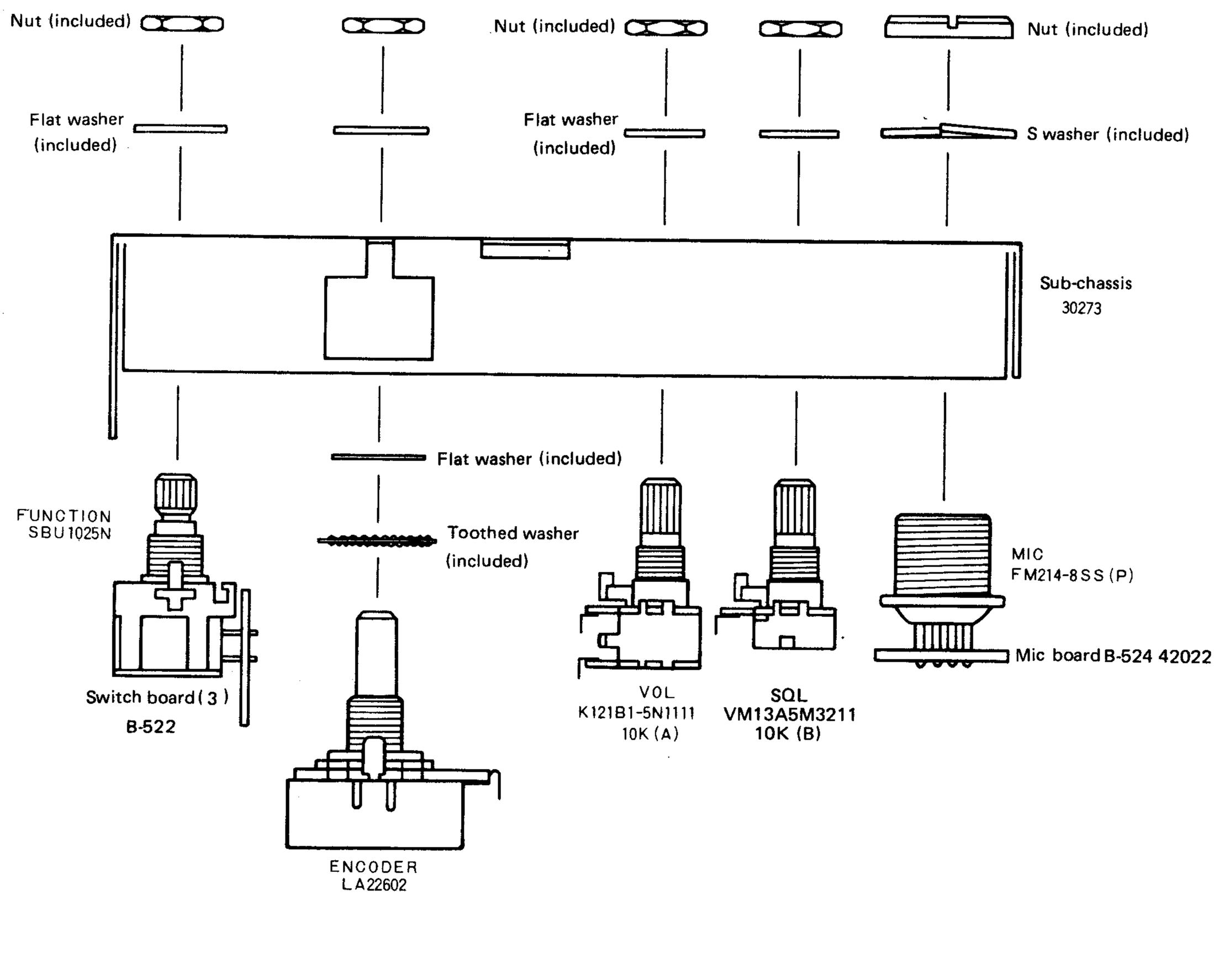
Removal of front frame and pushbuttons



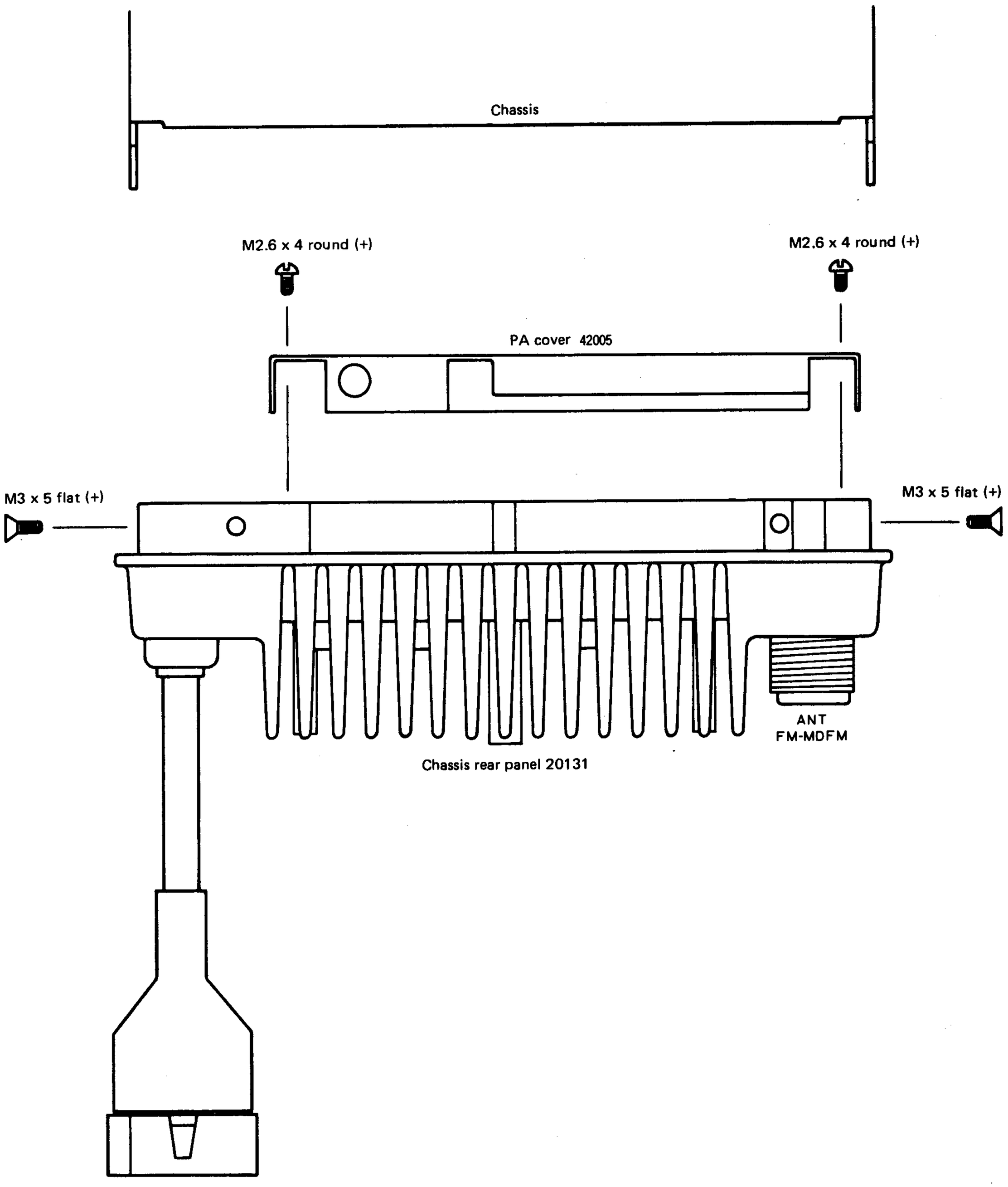
Replacement of front panel pushbuttons



Replacement of front panel controls

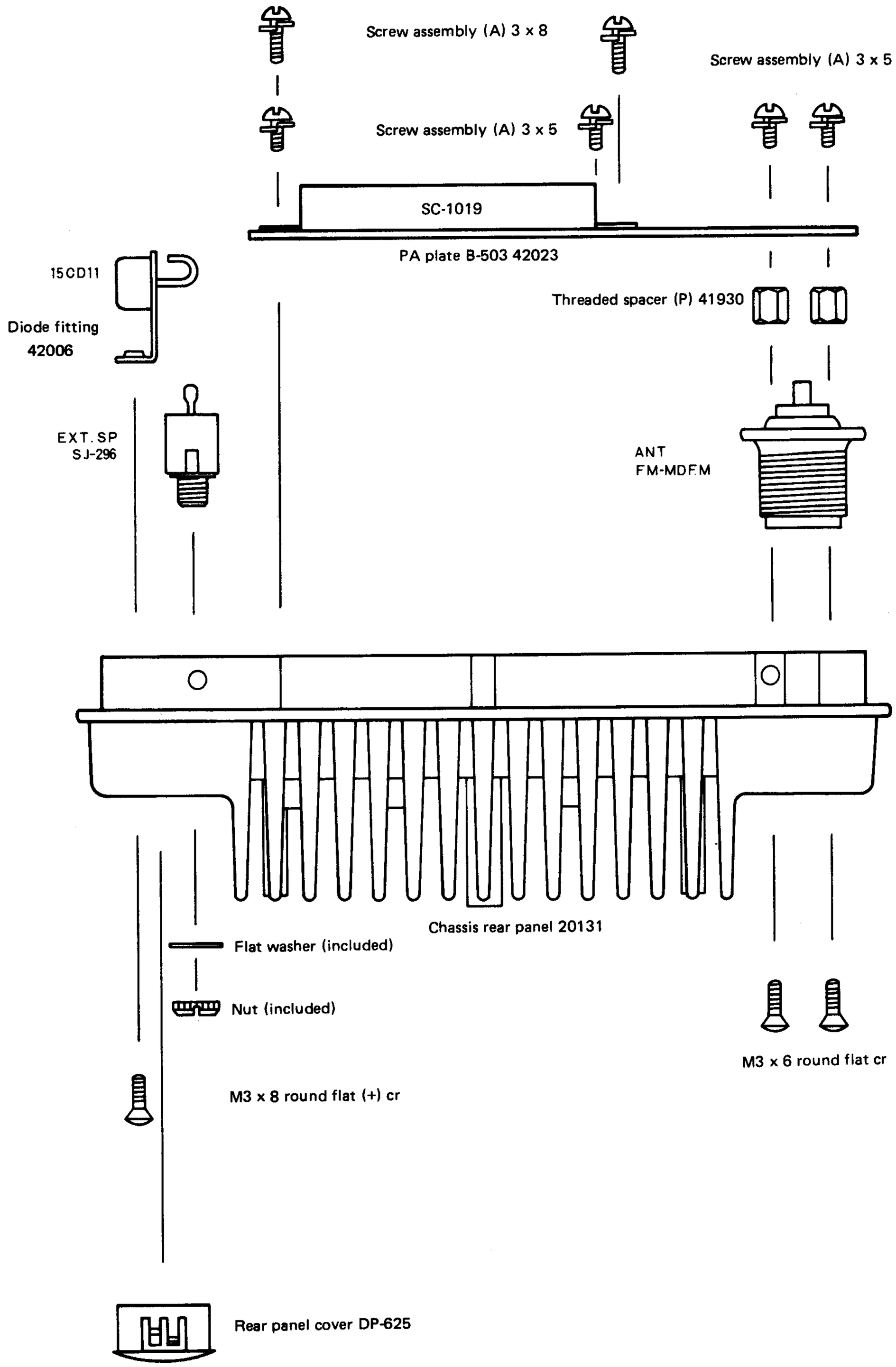


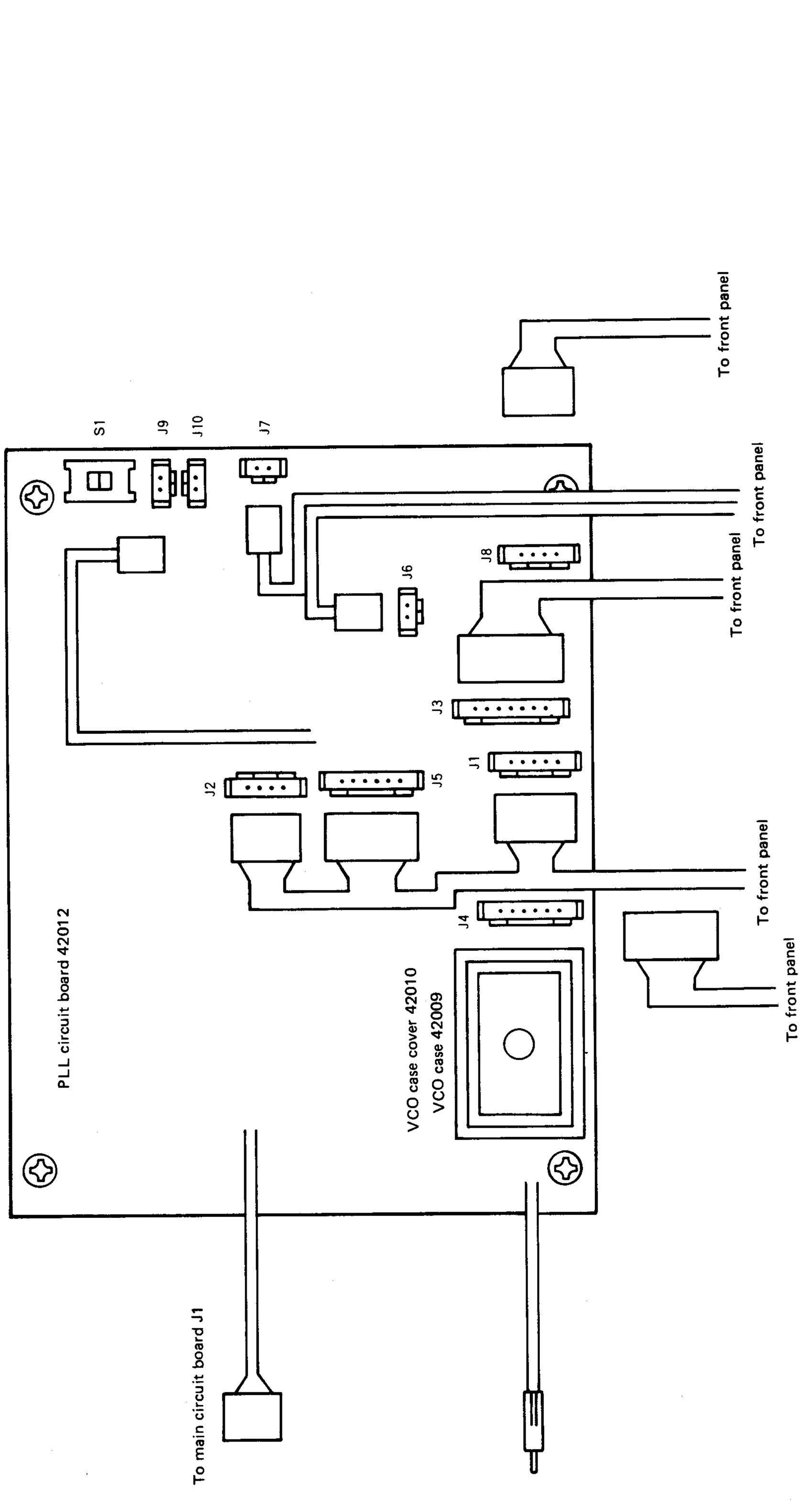
Disassembly of rear panel



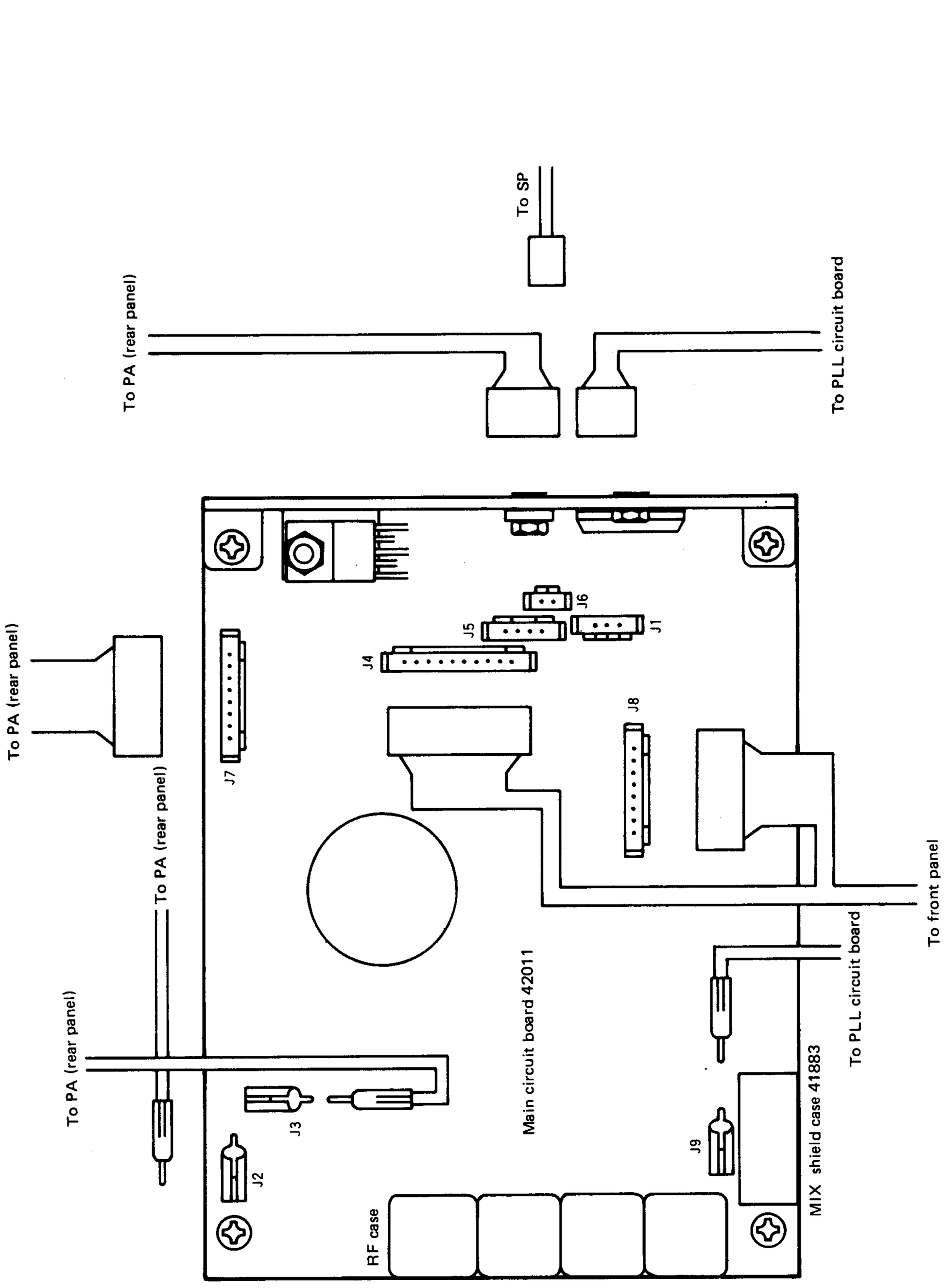
Chassis rear panel 20131

Disassembly of rear panel



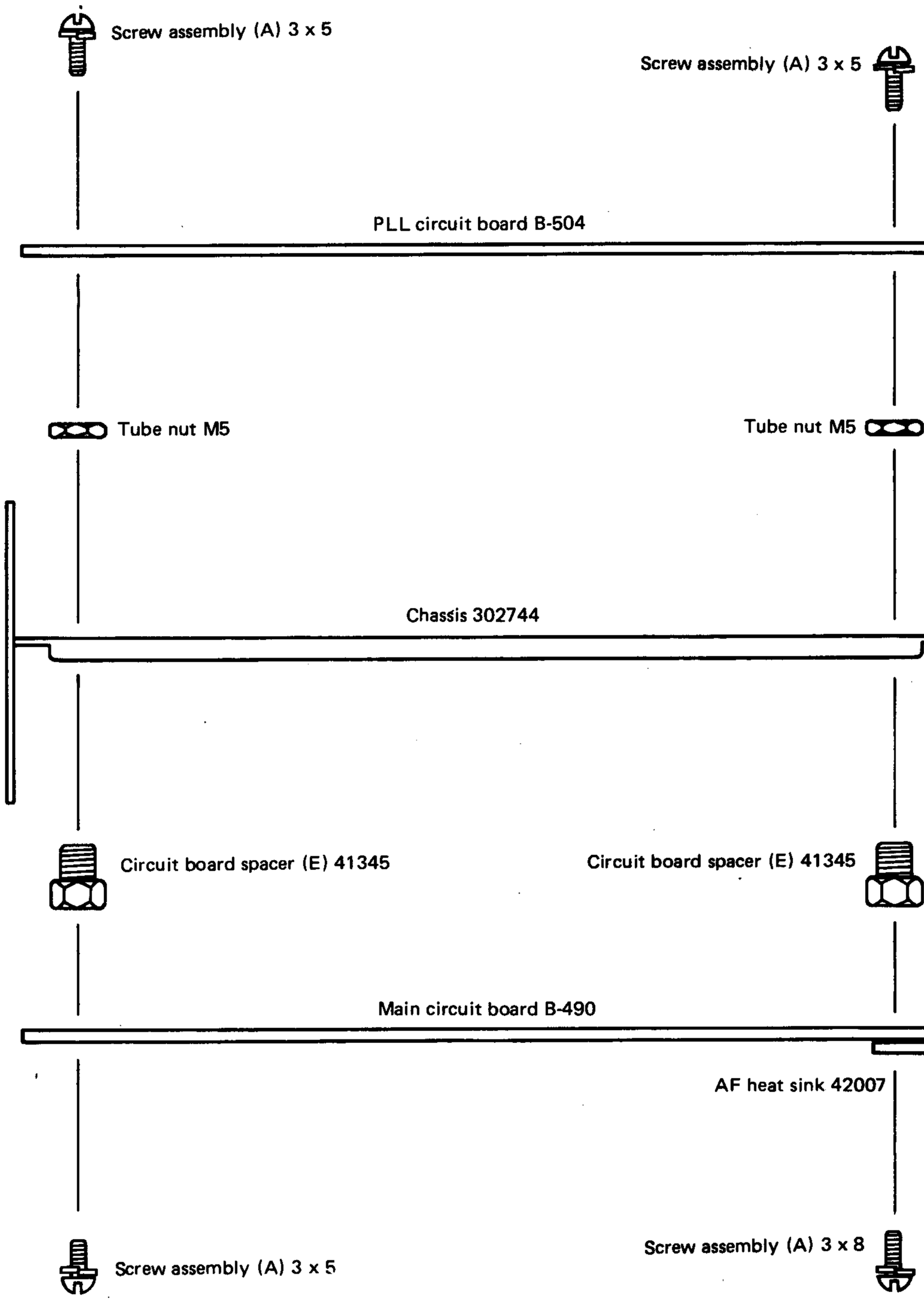


PLL unit wiring



Main unit wiring

Removal of circuit boards


Screw assembly (A) 3 x 5
Screw assembly (A) 3 x 5
PLL circuit board B-504
Tube nut M5
Tube nut M5
Chassis 302744
Circuit board spacer (E) 41345
Circuit board spacer (E) 41345
Main circuit board B-490
AF heat sink 42007
Screw assembly (A) 3 x 5
Screw assembly (A) 3 x 8

ADJUSTMENTS

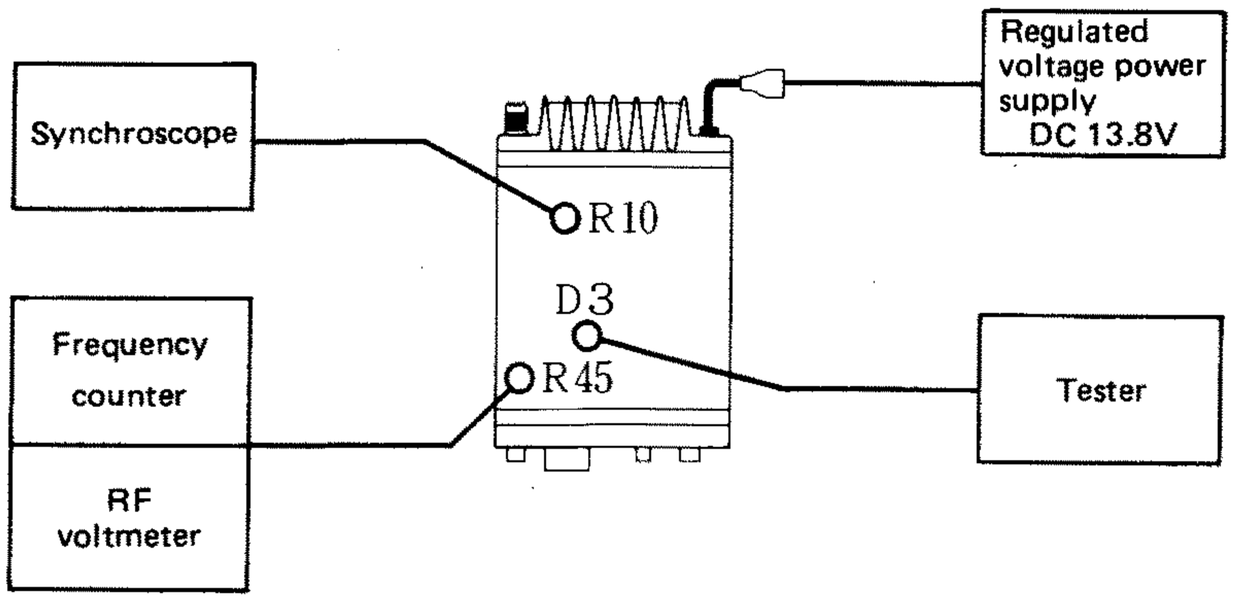
* **Adjustment numbers and locations are shown in ○ and □, and are shown in parts layout drawings.**

Notes for PLL adjustment	**Adjustment No. Location**

- **Measuring instruments for adjustment**

  Frequency counter (Frequency Range 0.1 ~ 160MHz)
  Synchroscope (which can measure 10 MHz and above)
  Multimeter (with internal resistance of approx. 40KΩ/V)
  RF voltmeter (Frequency Range 0.1 ~ 160MHz)
  Regulated voltage power supply (DC 13.8V output)

(Connection of measuring instruments)



1. Frequency adjustment

(1) Using the tuning control knob, set the displayed frequency to 145.00MHz.
(2) Connect the frequency conter to R45 of the PLL unit.
(3) Adjust L1 so that the frequency counter indication is 128.100MHz.

①
101

2. LO level adjustment

(1) Connect the synchroscope to R10 of the PLL unit.
(2) Adjust L2 so that the Amplitude of the waveform becomes 2.7Vp-p or greater.

②
102

3. VCO control voltage adjustment

(1) Using the tuning control knob, set the displayed frequency to 144.00MHz.
(2) Connect the multimeter to the cathode side of D3 of the PLL unit.
(3) Adjust L7 so that the voltage at D3 becomes about 4.2V

③
103

4. PLL output level check

(1) Connect the RF voltmeter to R45 of the PLL unit, and check to be sure that there is 220mV or more.

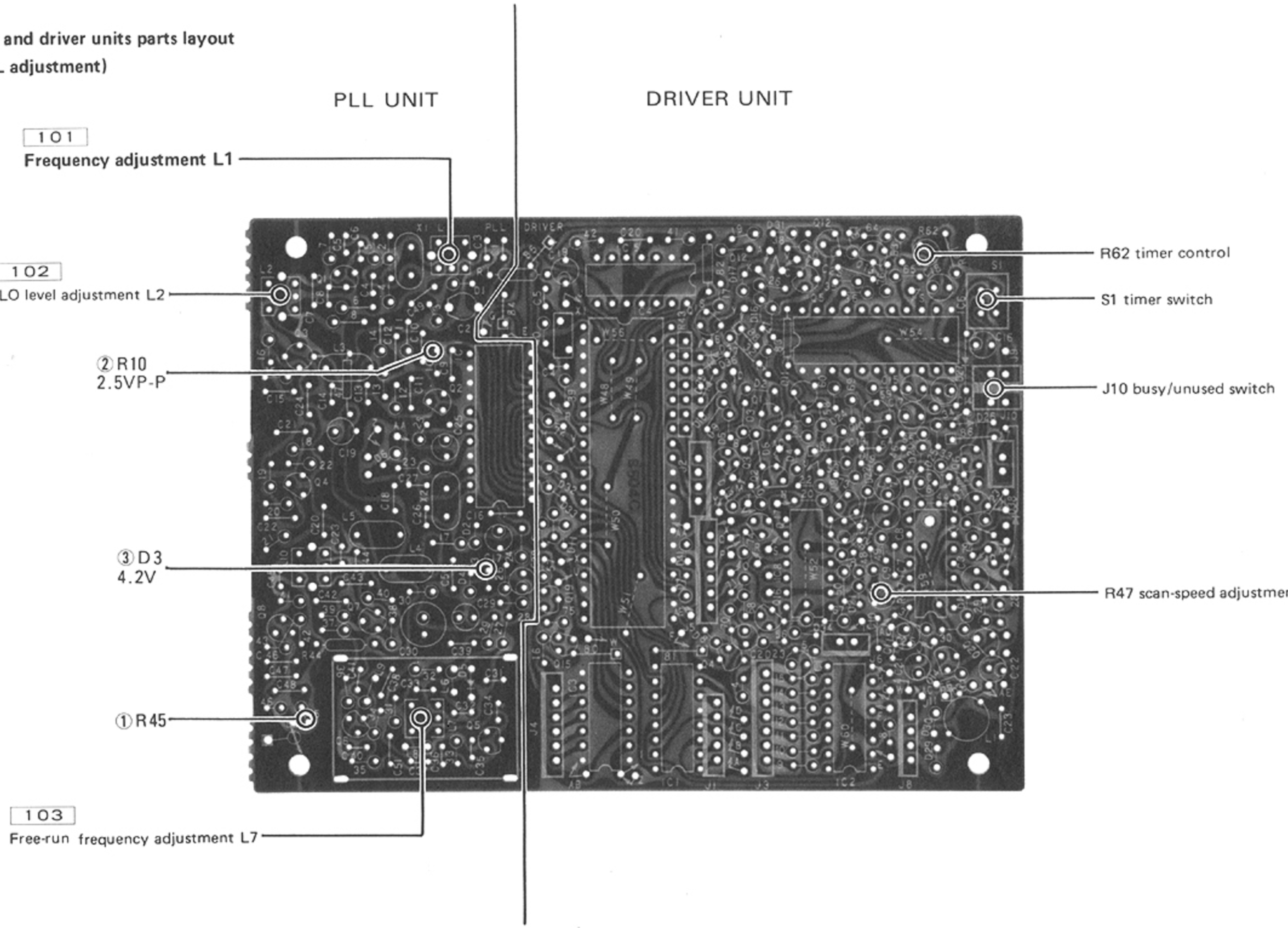
①

5. Reference frequency check

(1) With a reference frequency of 144.00MHz, connect the frequency counter to R45 of the PLL unit, and then check to be sure that the frequency is within the range of 127.1000MHz ± 200Hz.

①

PLL and driver units parts layout
(PLL adjustment)

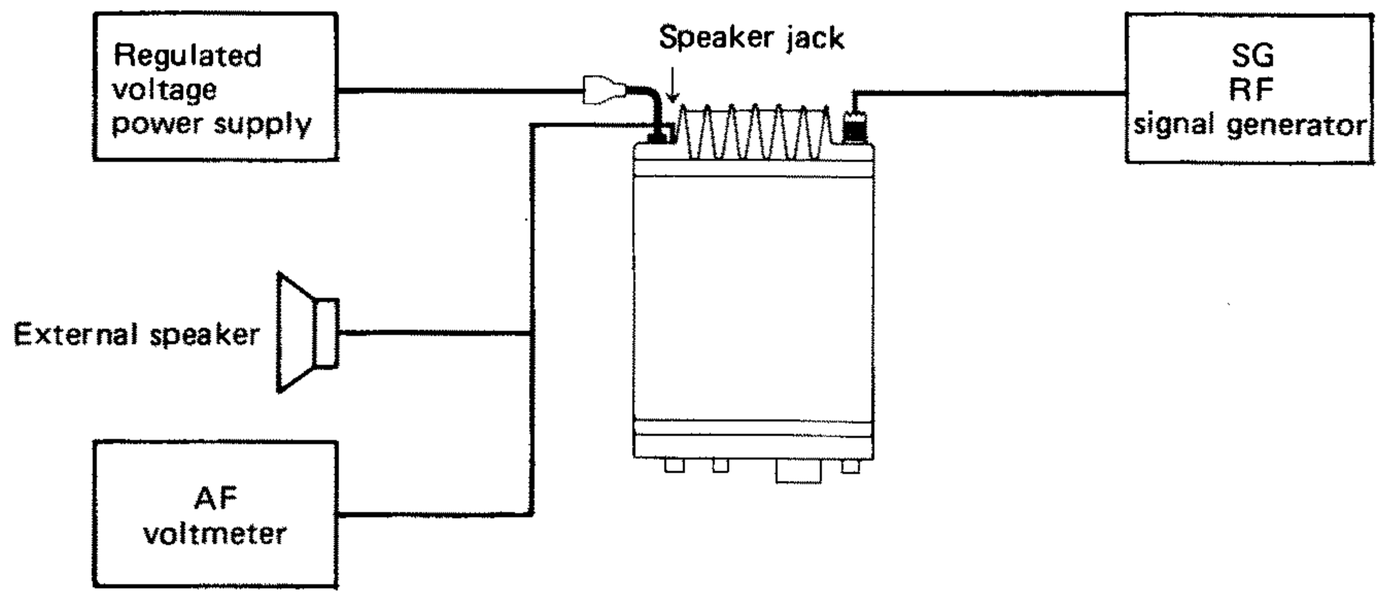


Receiver adjustments	Adjustment No. Location

- **Measuring instruments for adjustment**

  Regulated-voltage power supply (DC 13.8V output)
  AF voltmeter (millivoltmeter)
  RF signal generator (SG) (Frequency Range 10 ~ 150MHz)
  8Ω external speaker

  (Connection of measuring instruments)



1. Reception sensitivity adjustment

(1) Using the tuning control knob, set to a displayed frequency of 145.00MHz.
(2) Set an SG output to the extent that the S-meter just begins to move (modulated with 1kHz AF, 7.5kHz deviation) — 201 ④
(3) Turn L3, L2 and L1 of the main unit, and adjust so that the deflection of the S-meter is maximum. — 202 ④
(Apply the multimeter to the lead wire of R140 of the main unit, and make the adjustment so that the multimeter reading is maximum.)
(4) Next, set an SG output modulation of 3.5kHz.
(5) By using L21 of the main unit, make the adjustment so that the S-meter reading is maximum.
(Apply the multimeter to the lead wire of R140 of the main unit, and then make the adjustment so that the multimeter reading is maximum.)

Reception sensitivity:
20 dB noise-quieting sensitivity: 0.6μV or more
At 1μV input S + N/N: 30 dB or more

2. Discriminator adjustment — 203

(1) Using the tuning control knob, set to a displayed frequency of 145.00MHz.
(2) Adjust L22 so that AF output becomes maximum.

3. S-meter adjustment — 204

(1) With SG output at 10 dB, make adjustment of R80 so that four LED's of the S-meter illuminate.
(2) Next, with the SG output at 40 dB, check to be sure that all of the S-meter LED's are illuminated.

4. Squelch operation check

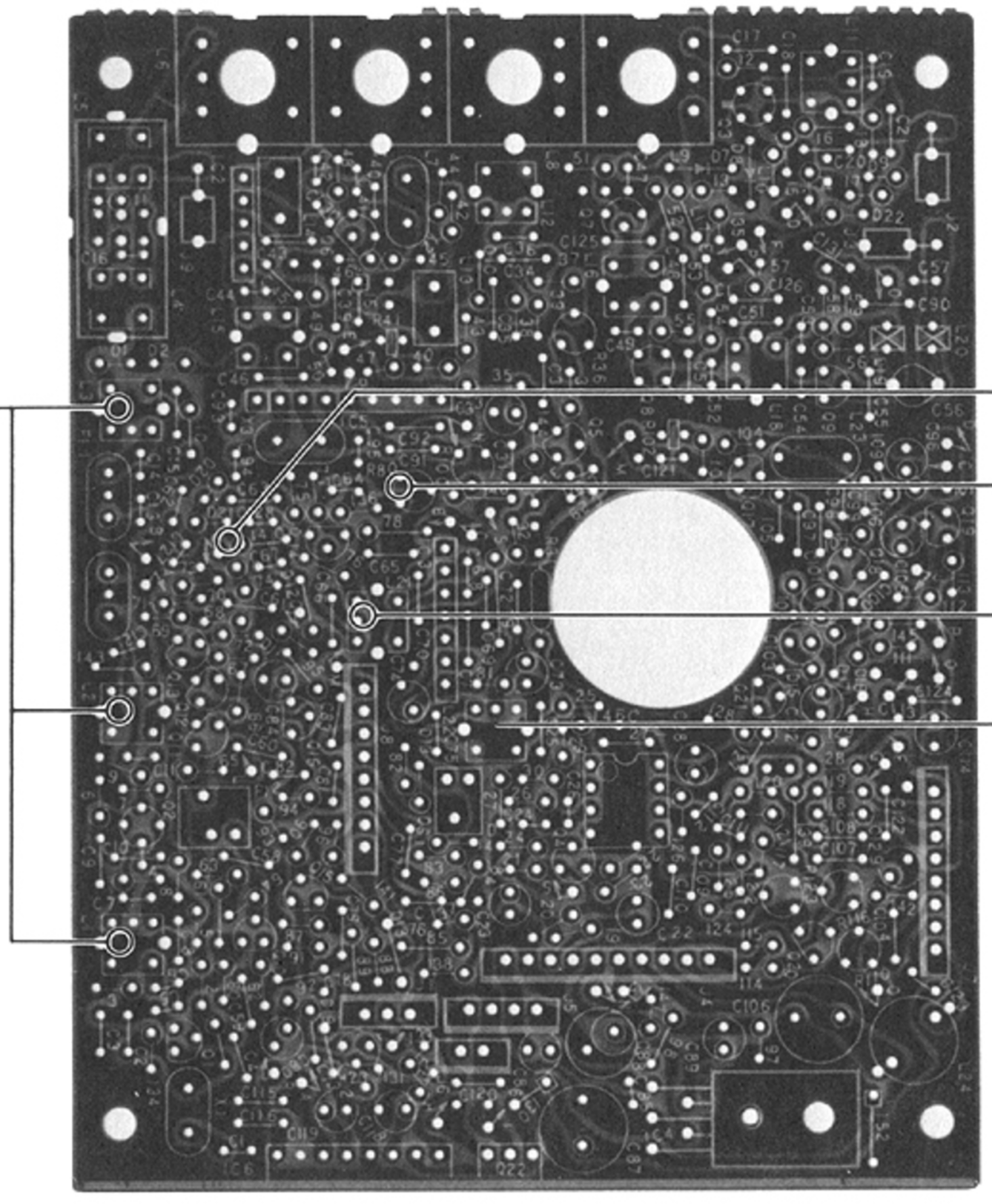
(1) With the SG output at 10 dB, and with SQL volume at maximum, check to be sure that the squelch opens.

5. AF output check

(1) With the SG output at 10 dB, check to be sure that AF output is 4V or more.

Note: Because there is the possibility, when these adjustments are made, that adjustment of the RF helical cavity may cause band deviation, cross-modulation, etc., it is recommended that the service department of our company be requested to make adjustment of the helical cavity if and when such adjustment becomes necessary.

Main unit parts layout (reception adjustment)

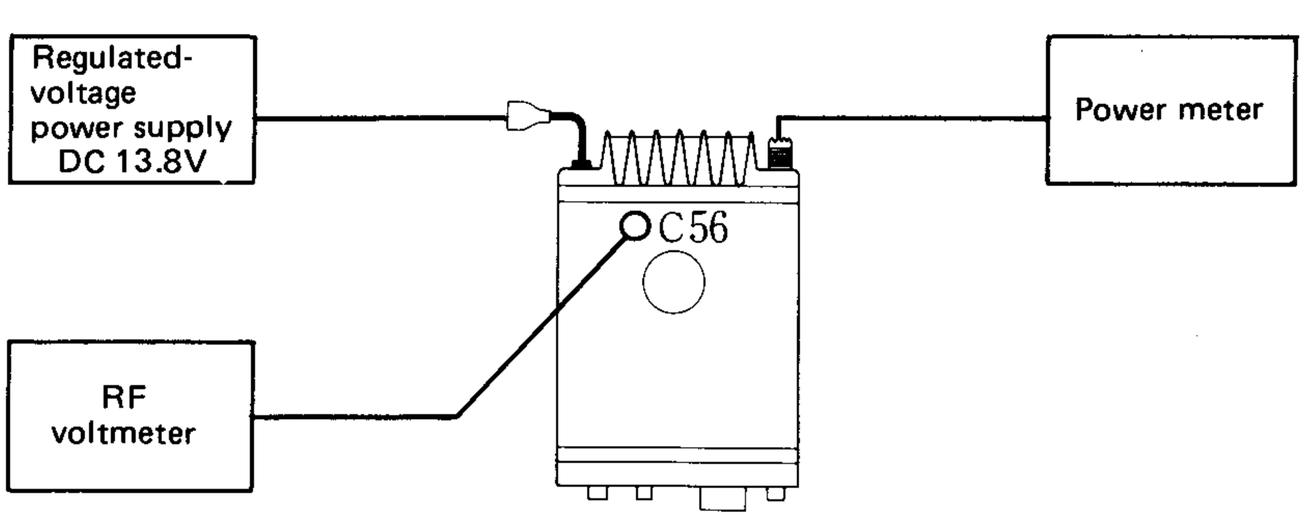


Notes for transmitter adjustment	Adjustment No. Location

- **Measuring instruments for adjustment**

  Power meter (terminated type 130 ~ 160MHz)
  RF voltmeter
  Regulated-voltage power supply (DC 13.8V output)

(Connections of measuring instruments)



1. Transmission output adjustment

(1) Using the tuning control knob, set the displayed frequency to 145.00MHz.
(2) Connect the power meter to the antenna connector.
(3) Short-circuit R118 and R119 of the main unit, and then disable the ALC. (Also the ALC can be disabled by turning R123 to the right.) ⑤
(4) Adjust L18 and C56 of the main unit so that the power becomes maximum. 301
(5) Connect the RF voltmeter to the rotator of C56, and then make adjustment of L15 and L16 so that voltage becomes maximum. 302
(6) Once again repeat the adjustment of L18 and C56.

2. Setting the power

(1) When the power is high, adjust R123 of the main unit to a setting of 25W. 303
(2) When the power is low, adjust R116 of the main unit to a setting of approximately 1.2W. 304

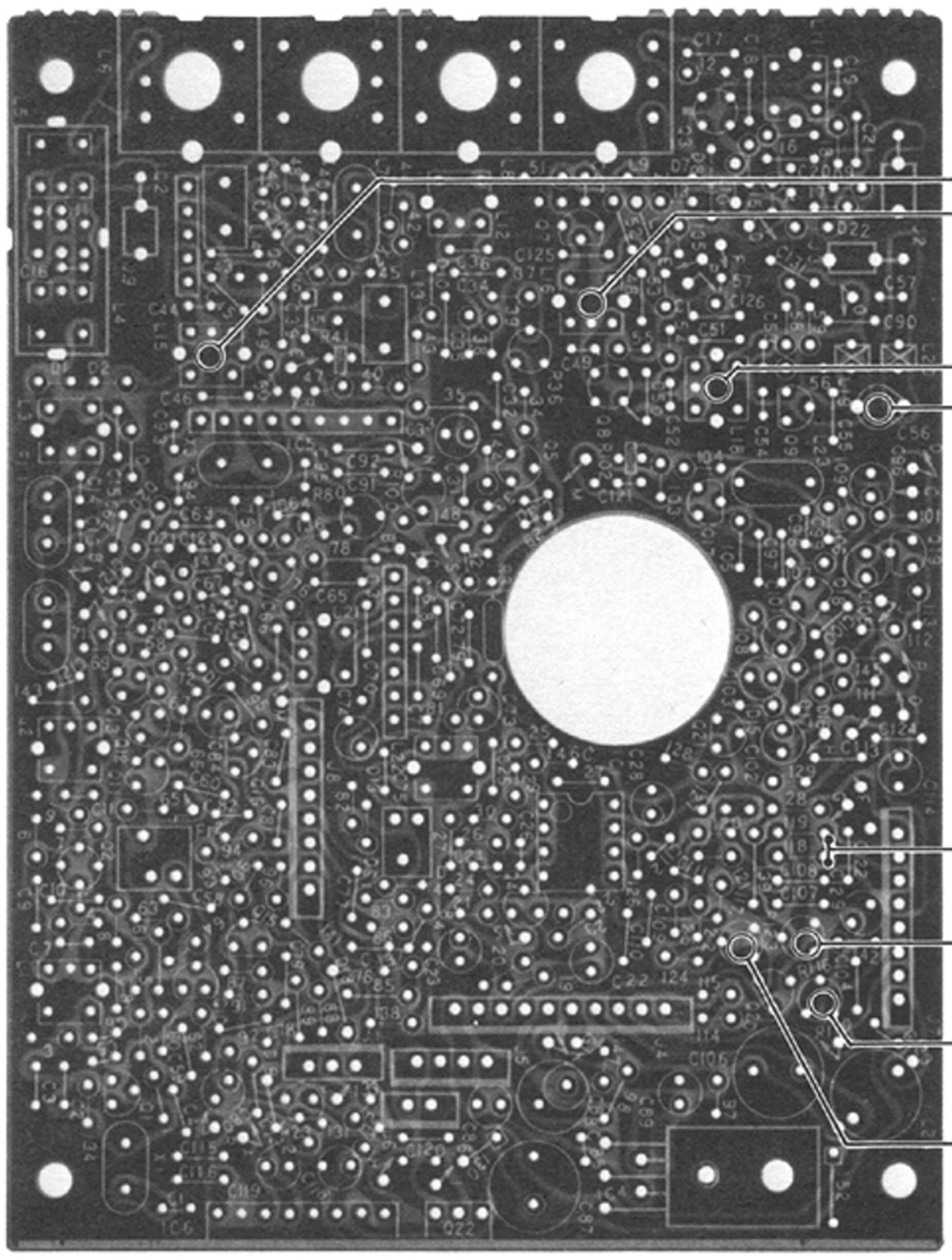
3. RF meter display adjustment

(1) When the power is low, make adjustment of R110 so that three LED's of the meter (LED) illuminate. 305
(2) In this condition, switch to high power, and check to be sure all seven LED's illuminate.

4. APC current check

(1) Disconnect the power meter from the antenna connector, measure the current, and check to be sure that the measured reading is equivalent to, or lower than, the transmission current.

Main unit parts layout (transmission adjustment)



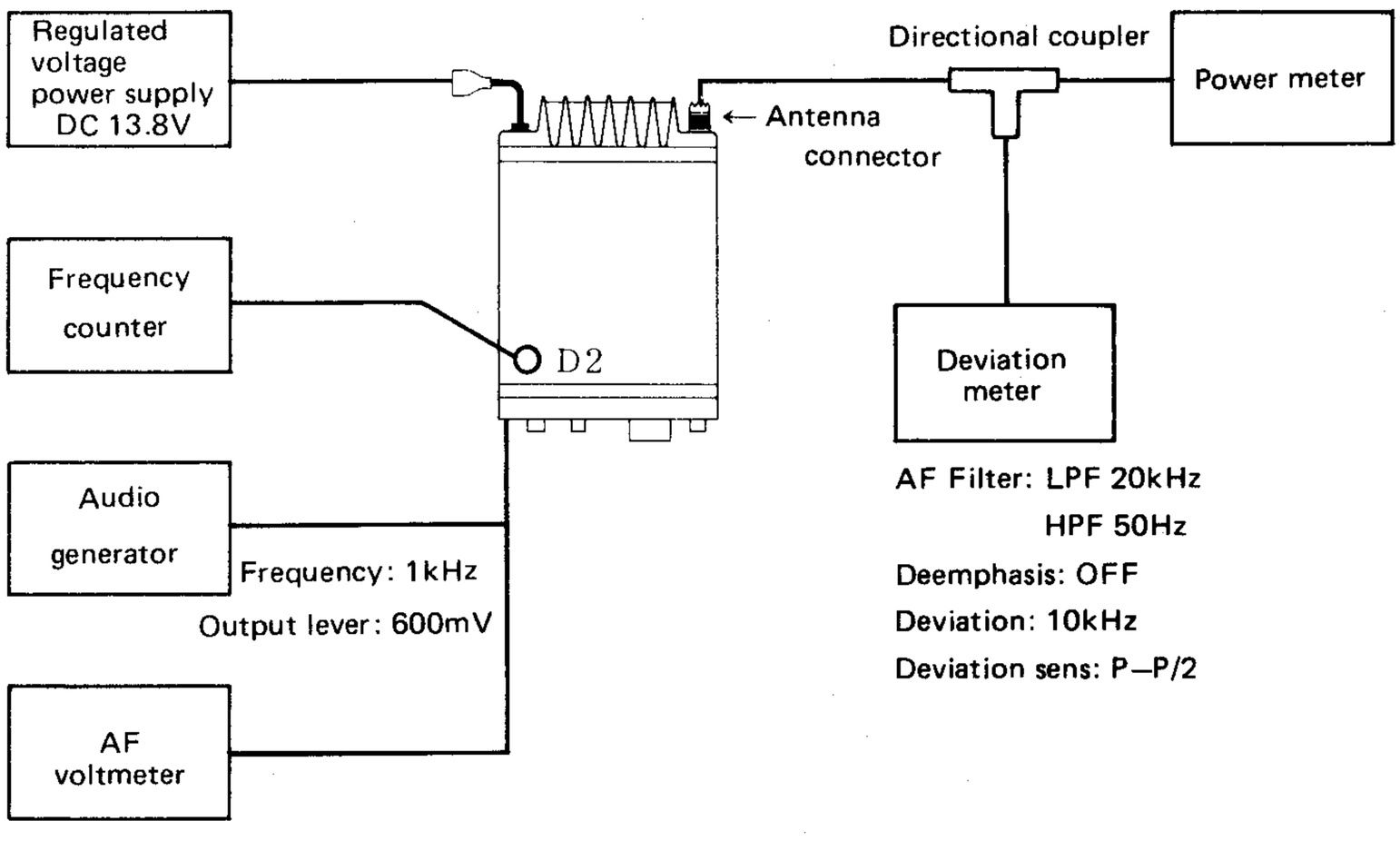
Modulation adjustment

Adjustment No. Location

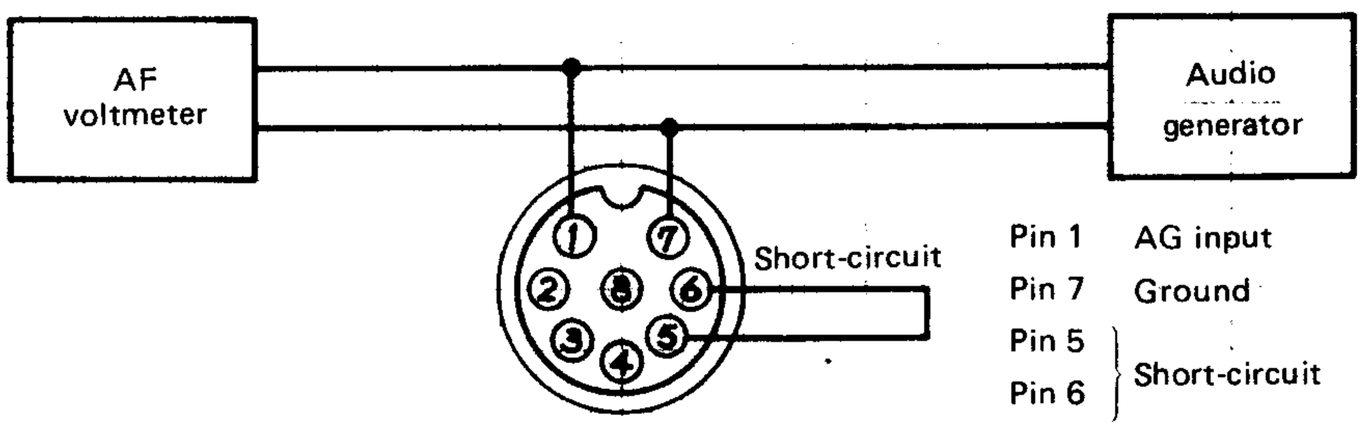
- **Measuring instruments for adjustment**

  Audio generator (AG)
  Deviation meter
  Frequency counter
  Directional coupler
  AF voltmeter (milli-voltmeter)

(Connection of measuring instruments)



Microphone connector (8 pin) connections



1. Local oscillation frequency adjustment

(1) Connect the frequency counter to D2 of the main unit.
(2) Make adjustment of L12 of the main unit so that the frequency is within the range of 16.900MHz ± 100Hz.

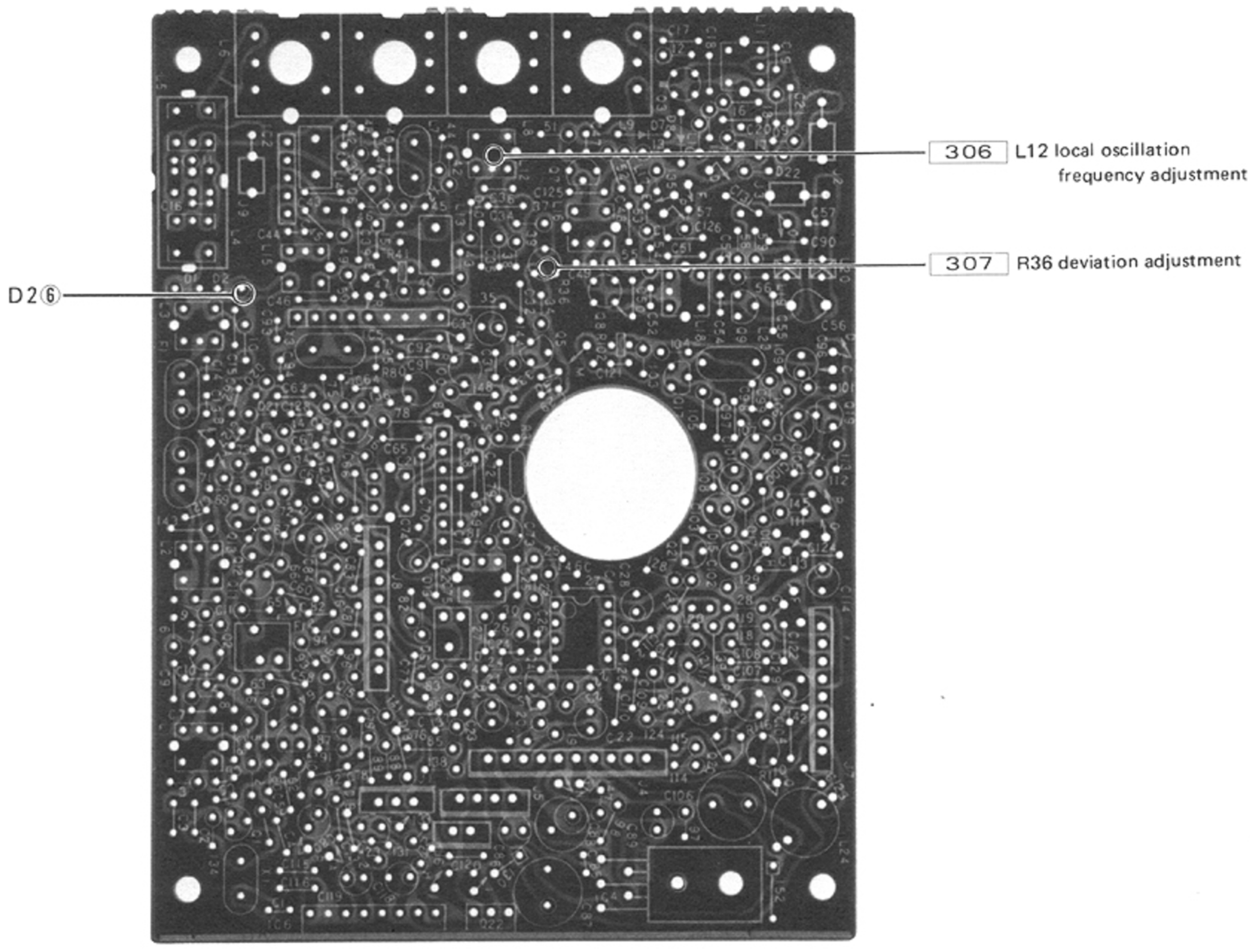
⑥
306

2. Deviation adjustment

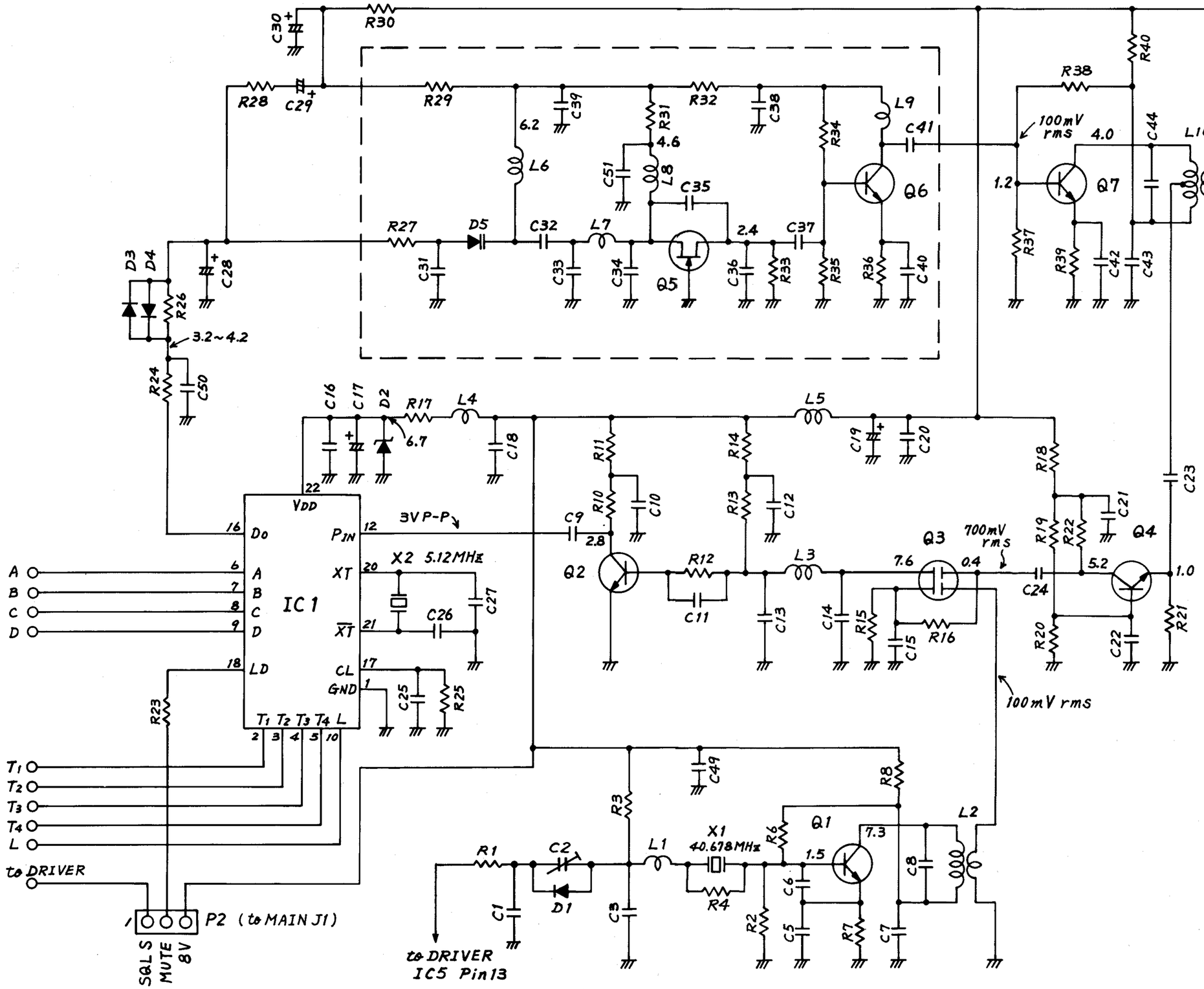
(1) Input an AG signal (1kHz, 600mV) to the microphone input terminal, and, by using R36 of the main unit, make the adjustment for 4.8kHz ± 0.2kHz.
(2) Next, reduce the AG input signal by 20 dB, and, at an input of 60mV, check to be sure that the deviation is then 3.5kHz or more.

307

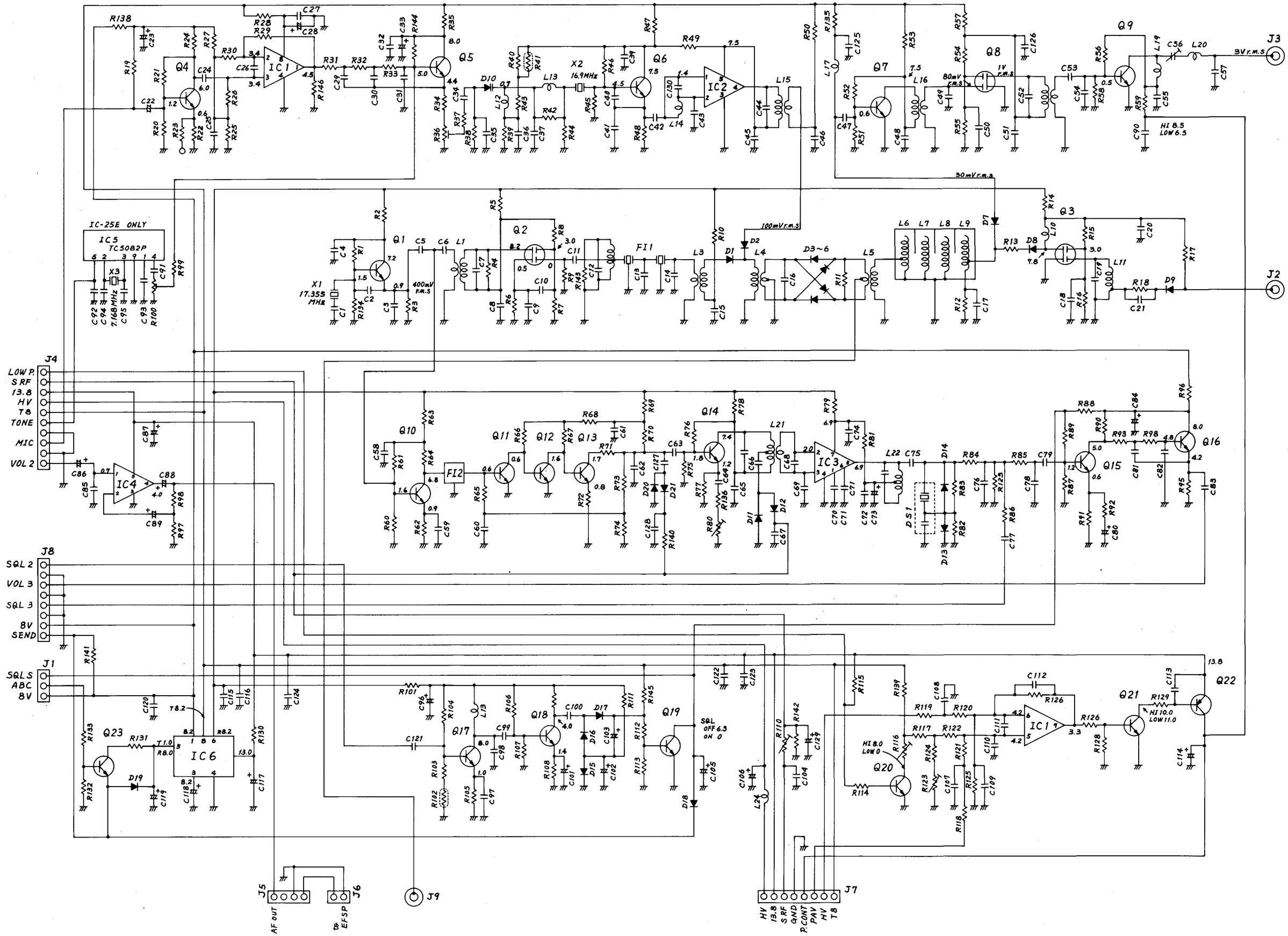
Main unit parts layout (modulation adjustment)



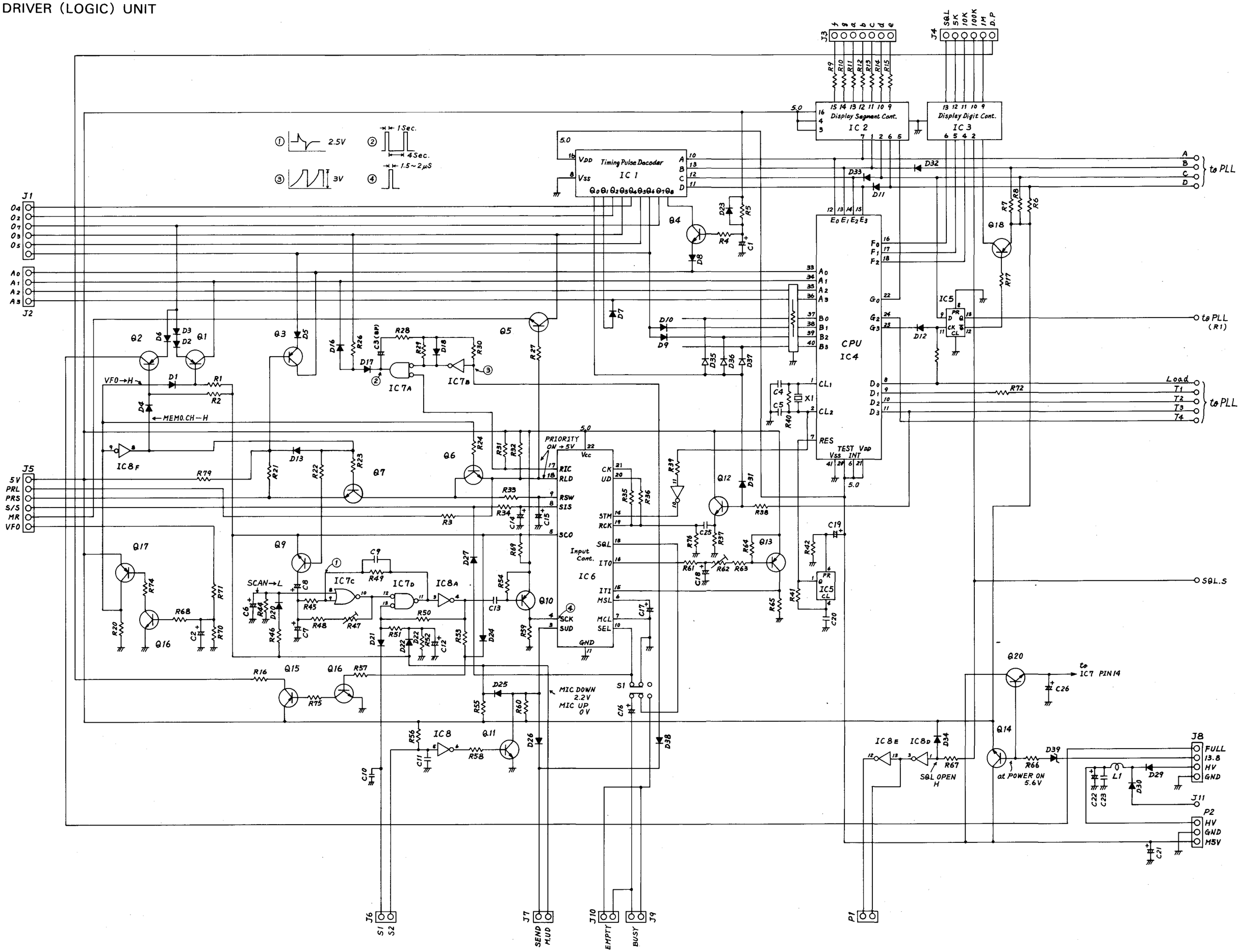
PLL UNIT CIRCUIT DIAGRAM AND VOLTAGE CHART



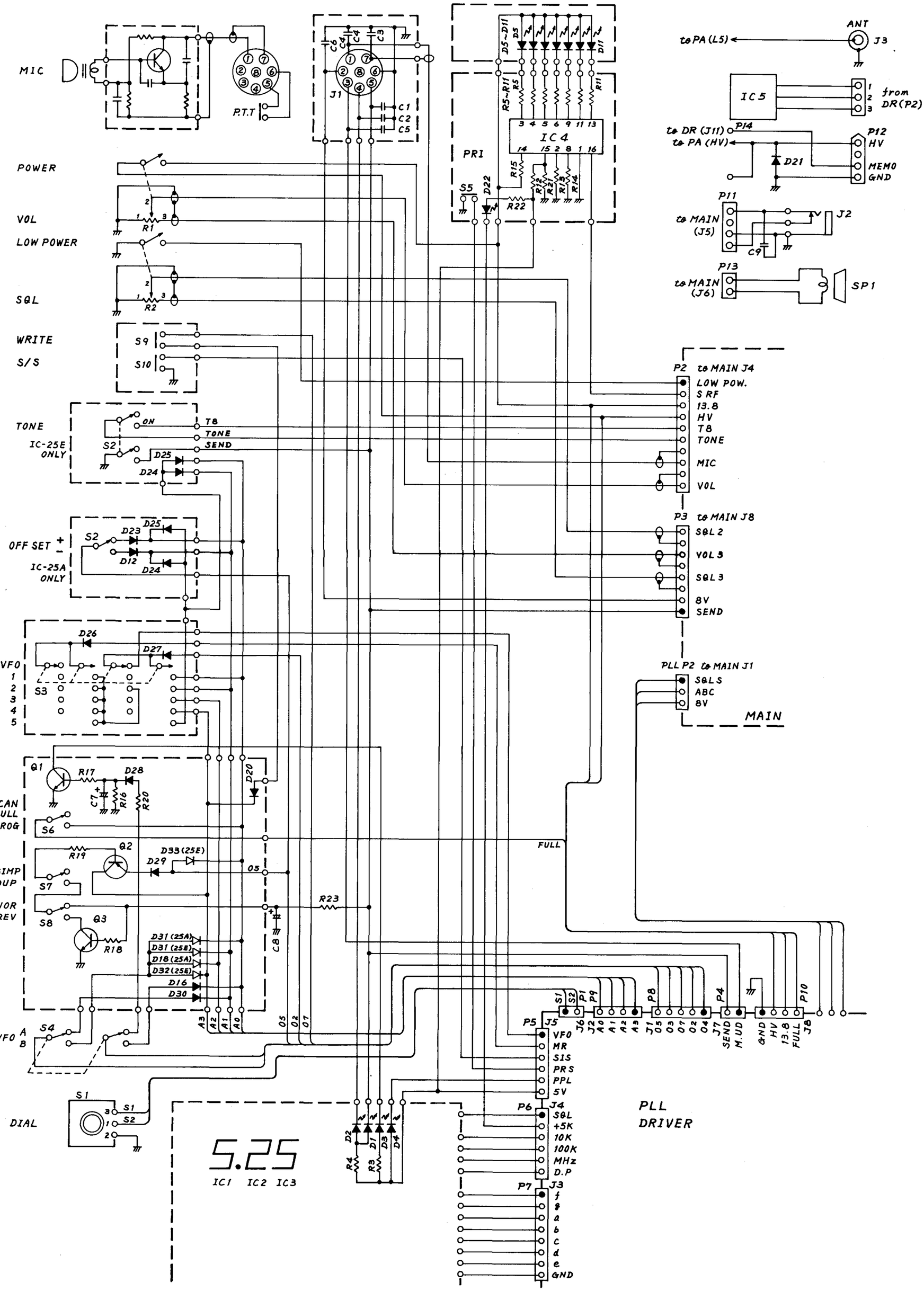
MAIN UNIT CIRCUIT DIAGRAM AND VOLTAGE CHART



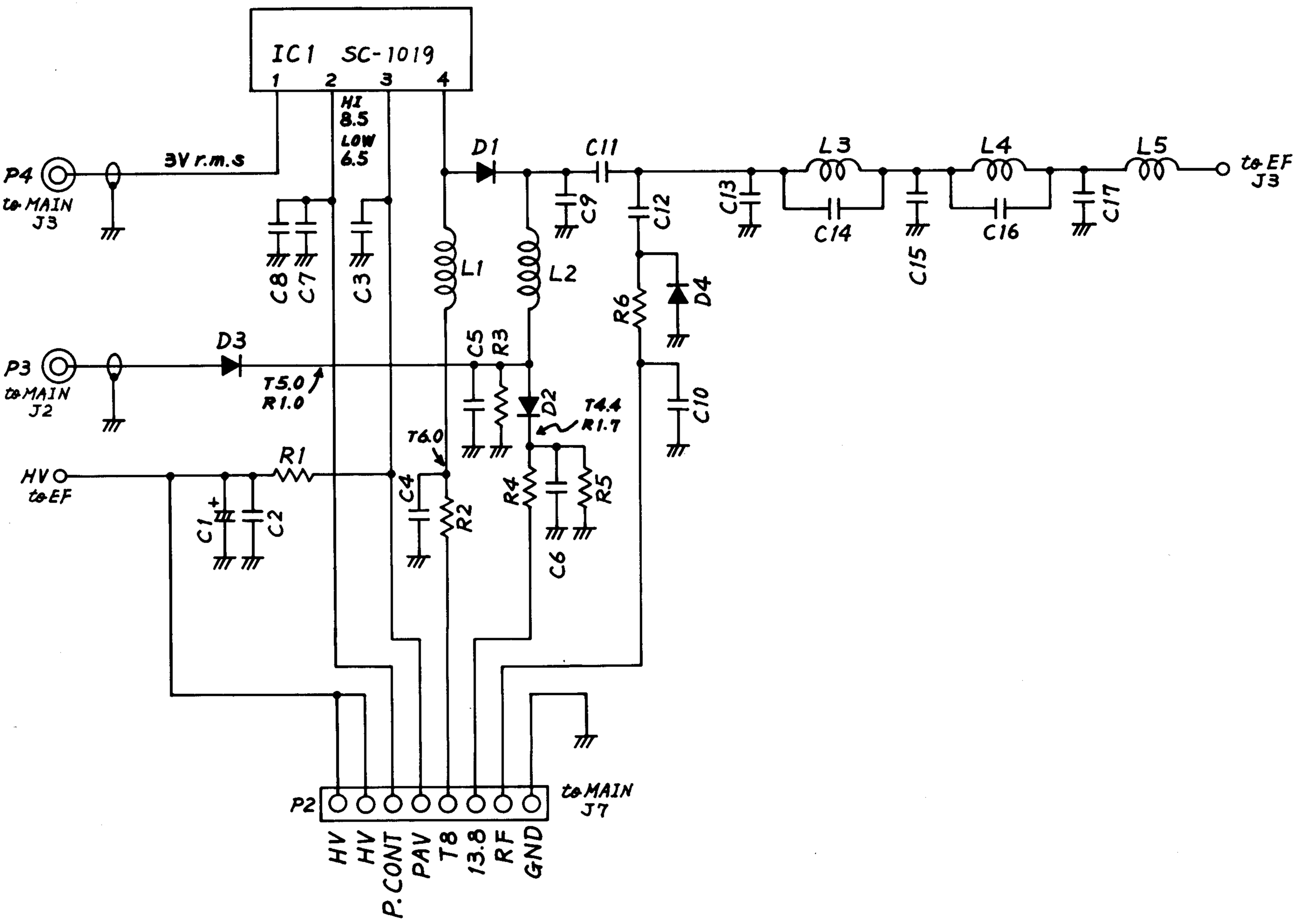
DRIVER (LOGIC) UNIT



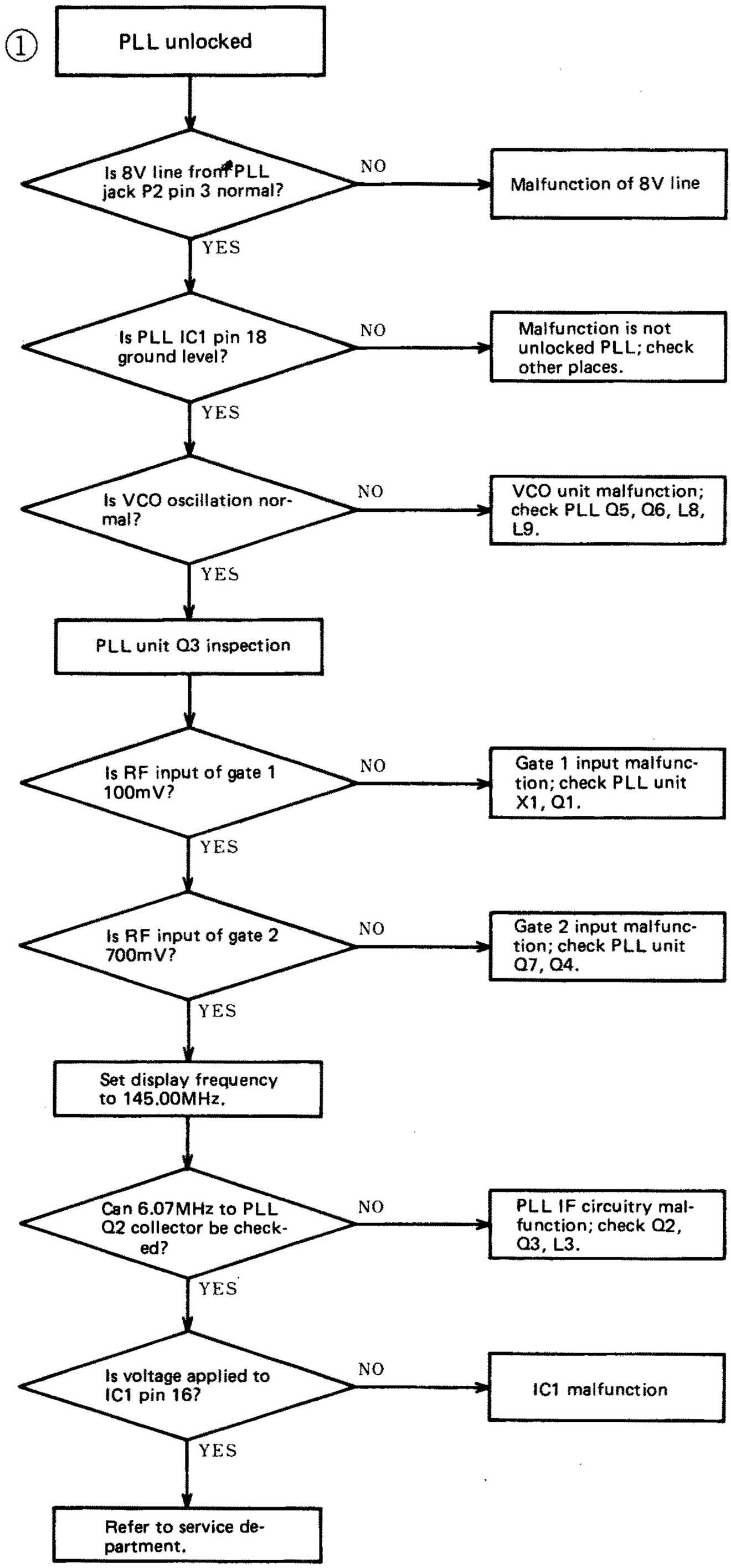
EF UNIT CIRCUIT DIAGRAM



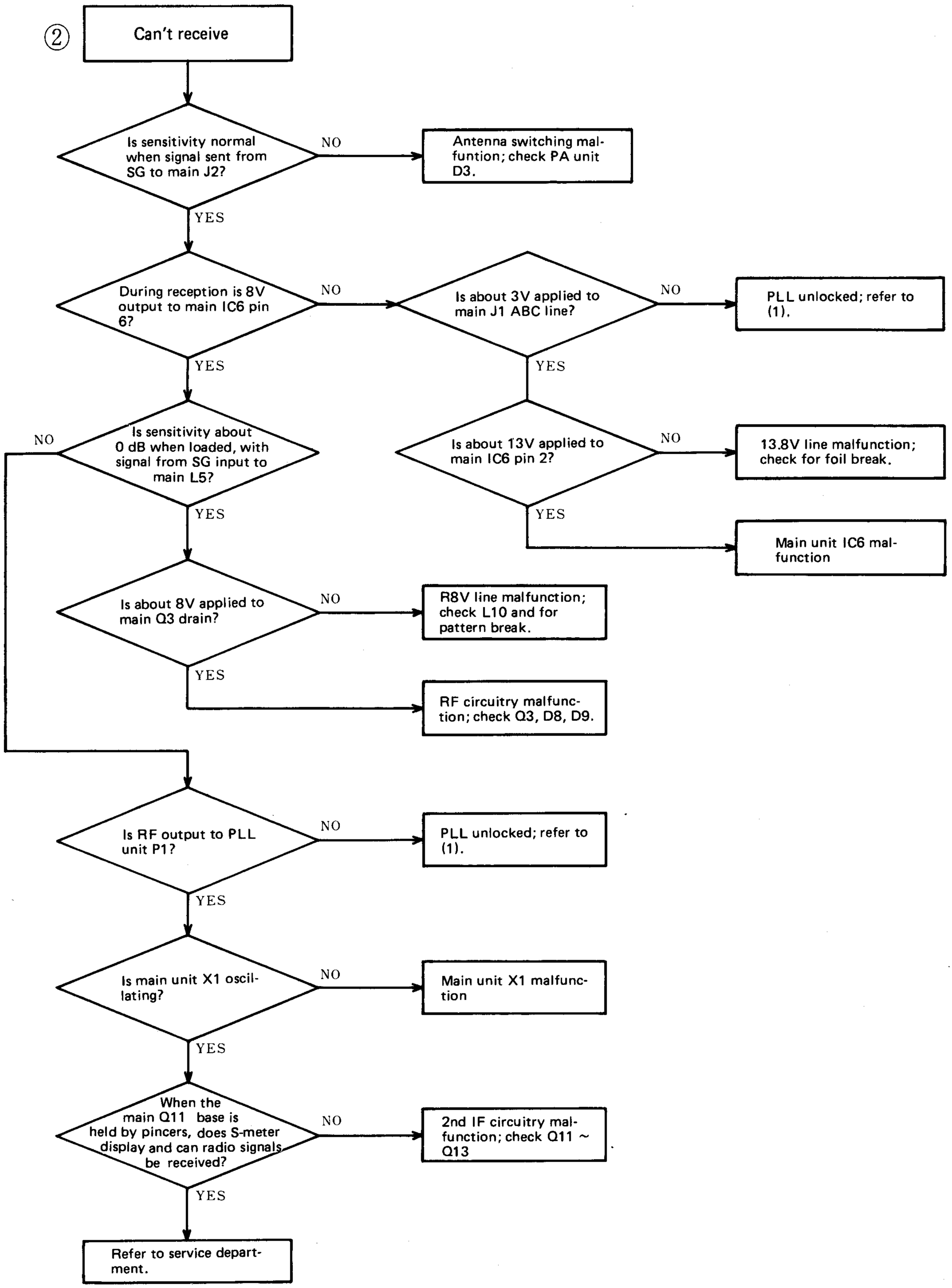
PA UNIT CIRCUIT DIAGRAM AND VOLTAGE CHART

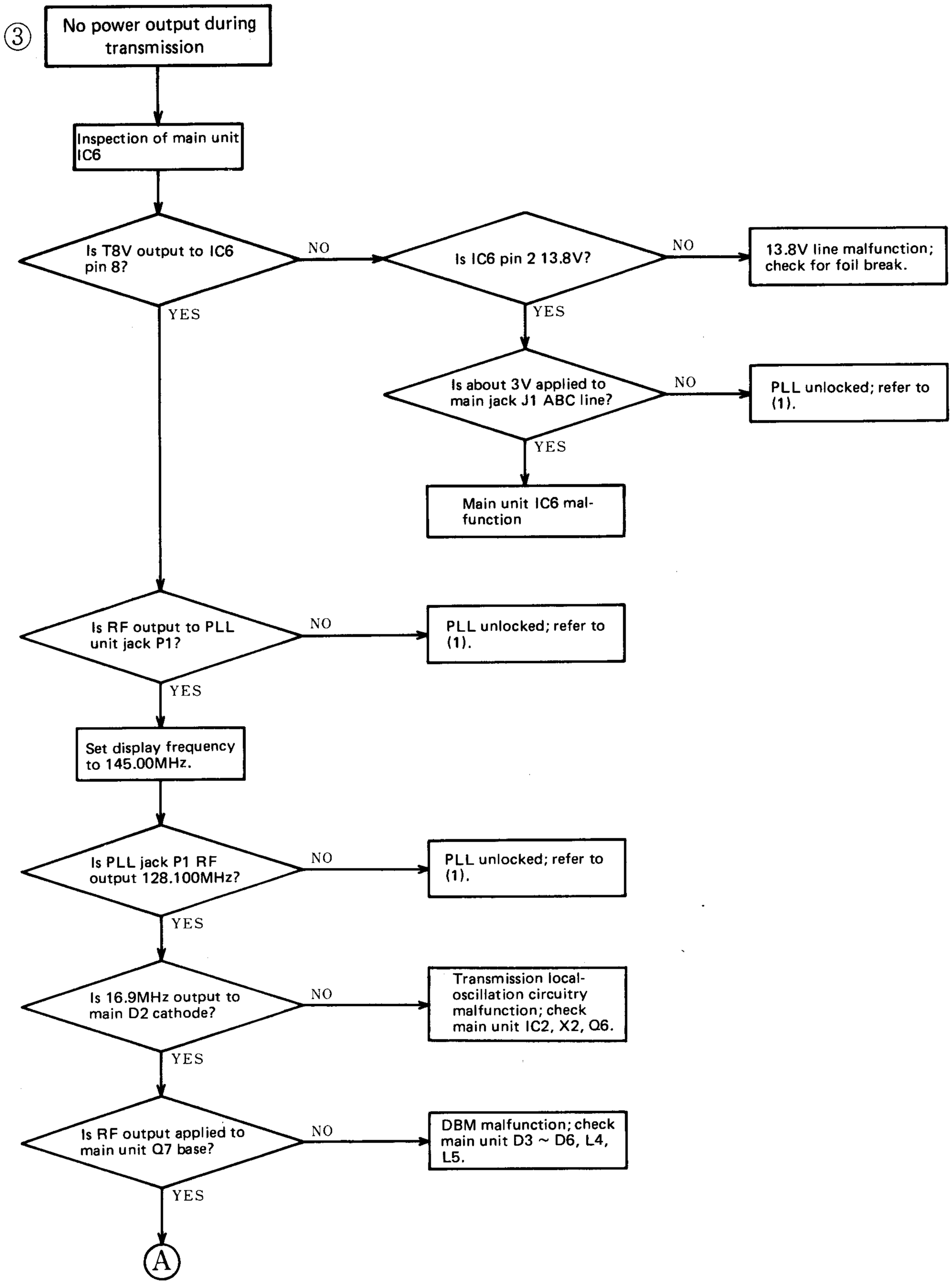


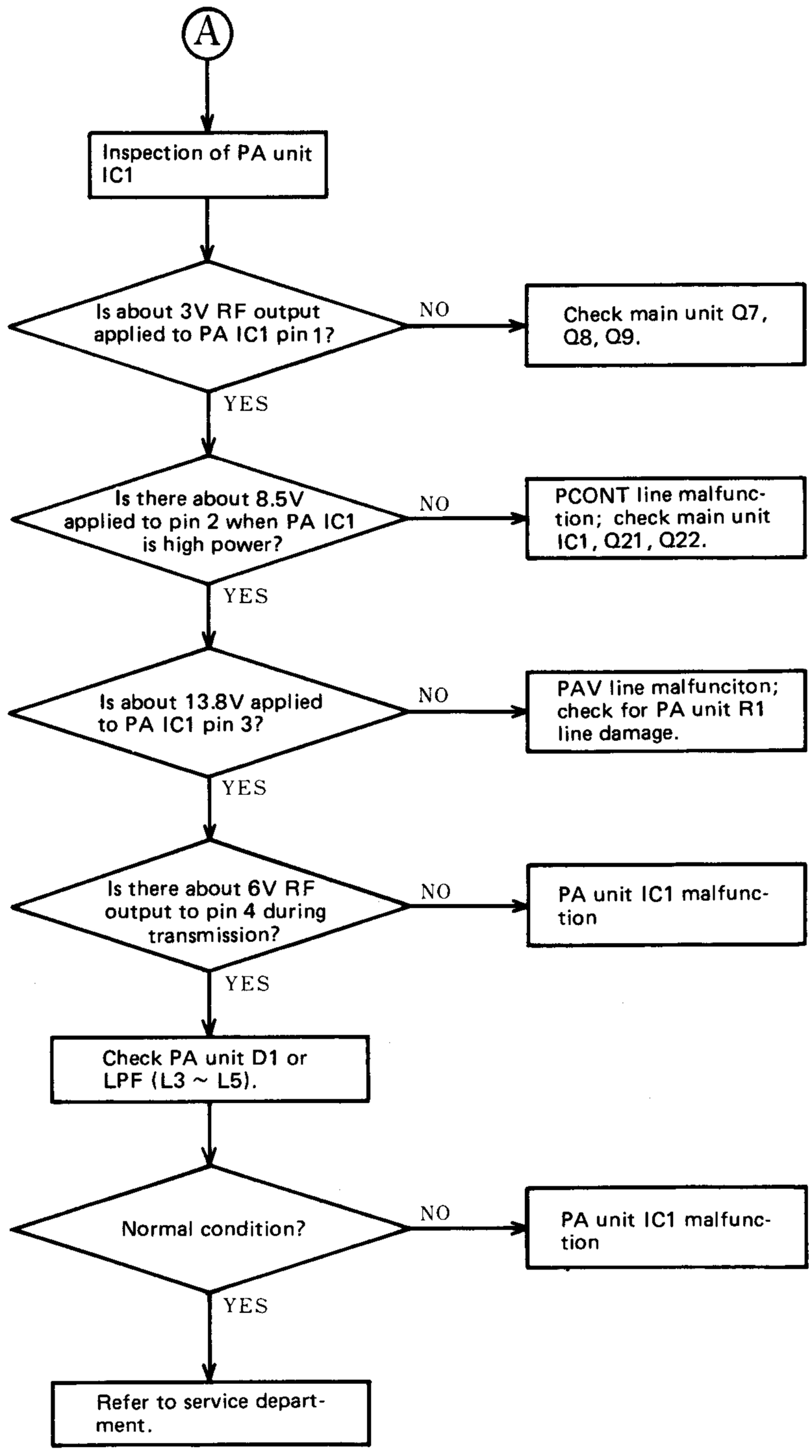
TROUBLESHOOTING GUIDE

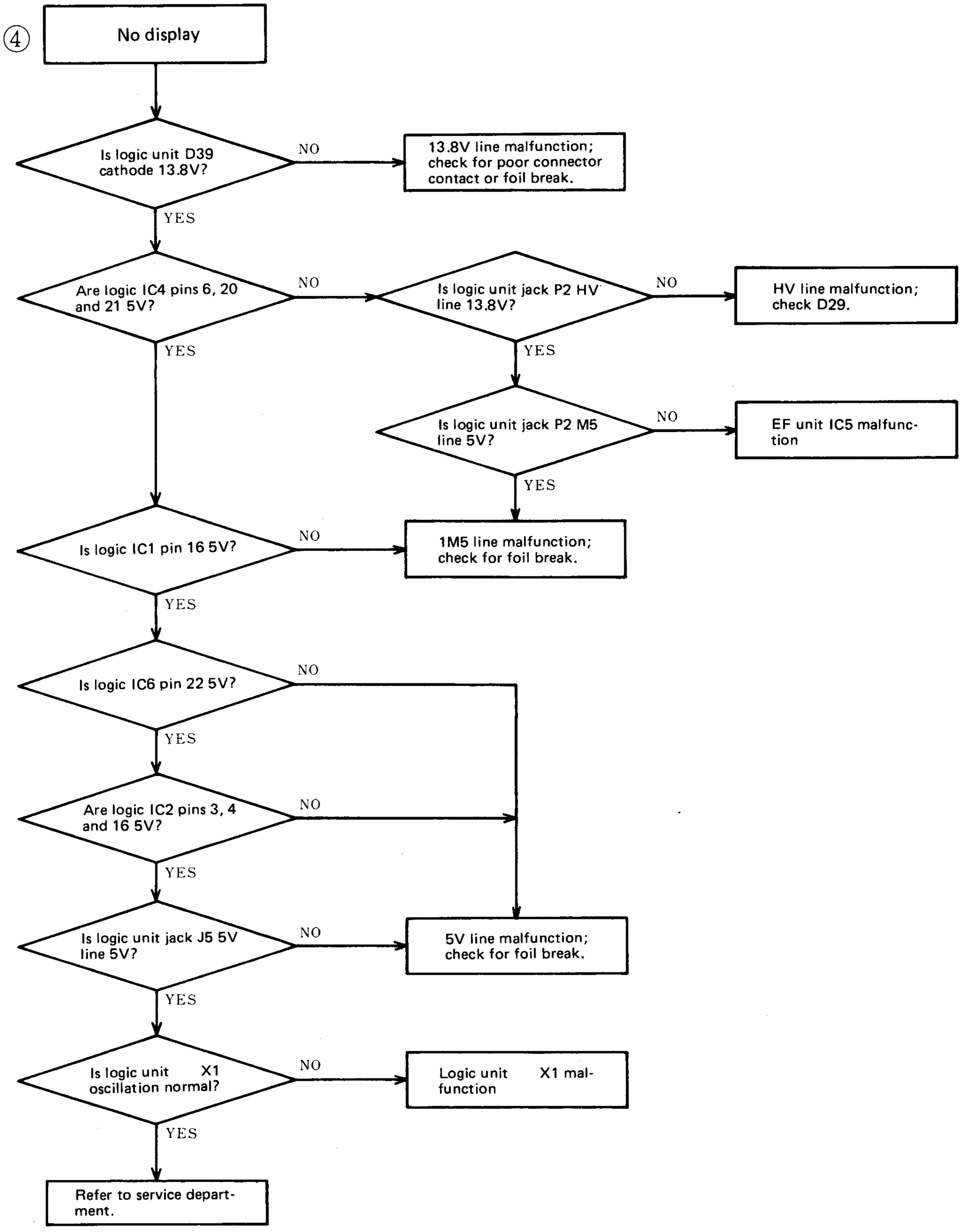


② Can't receive


Is sensitivity normal when signal sent from SG to main J2?
NO
Antenna switching malfuntion; check PA unit D3.
YES
During reception is 8V output to main IC6 pin 6?
NO
Is about 3V applied to main J1 ABC line?
NO
PLL unlocked; refer to (1).
YES
YES
Is sensitivity about 0 dB when loaded, with signal from SG input to main L5?
NO
Is about 13V applied to main IC6 pin 2?
NO
13.8V line malfunction; check for foil break.
YES
YES
Main unit IC6 malfunction
Is about 8V applied to main Q3 drain?
NO
R8V line malfunction; check L10 and for pattern break.
YES
RF circuitry malfunction; check Q3, D8, D9.
Is RF output to PLL unit P1?
NO
PLL unlocked; refer to (1).
YES
Is main unit X1 oscillating?
NO
Main unit X1 malfunction
YES
When the main Q11 base is held by pincers, does S-meter display and can radio signals be received?
NO
2nd IF circuitry malfunction; check Q11 ~ Q13
YES
Refer to service department.


③
No power output during transmission
Inspection of main unit IC6
Is T8V output to IC6 pin 8?
NO
Is IC6 pin 2 13.8V?
NO
13.8V line malfunction; check for foil break.
YES
YES
Is about 3V applied to main jack J1 ABC line?
NO
PLL unlocked; refer to (1).
YES
Main unit IC6 malfunction
Is RF output to PLL unit jack P1?
NO
PLL unlocked; refer to (1).
YES
Set display frequency to 145.00MHz.
Is PLL jack P1 RF output 128.100MHz?
NO
PLL unlocked; refer to (1).
YES
Is 16.9MHz output to main D2 cathode?
NO
Transmission local-oscillation circuitry malfunction; check main unit IC2, X2, Q6.
YES
Is RF output applied to main unit Q7 base?
NO
DBM malfunction; check main unit D3 ~ D6, L4, L5.
YES
A


A
Inspection of PA unit IC1
Is about 3V RF output applied to PA IC1 pin 1?
NO
Check main unit Q7, Q8, Q9.
YES
Is there about 8.5V applied to pin 2 when PA IC1 is high power?
NO
PCONT line malfunction; check main unit IC1, Q21, Q22.
YES
Is about 13.8V applied to PA IC1 pin 3?
NO
PAV line malfunciton; check for PA unit R1 line damage.
YES
Is there about 6V RF output to pin 4 during transmission?
NO
PA unit IC1 malfunction
YES
Check PA unit D1 or LPF (L3 ~ L5).
Normal condition?
NO
PA unit IC1 malfunction
YES
Refer to service department.


④
No display
Is logic unit D39 cathode 13.8V?
NO
13.8V line malfunction; check for poor connector contact or foil break.
YES
Are logic IC4 pins 6, 20 and 21 5V?
NO
Is logic unit jack P2 HV line 13.8V?
NO
HV line malfunction; check D29.
YES
YES
Is logic unit jack P2 M5 line 5V?
NO
EF unit IC5 malfunction
YES
Is logic IC1 pin 16 5V?
NO
1M5 line malfunction; check for foil break.
YES
Is logic IC6 pin 22 5V?
NO
YES
Are logic IC2 pins 3, 4 and 16 5V?
NO
YES
Is logic unit jack J5 5V line 5V?
NO
5V line malfunction; check for foil break.
YES
Is logic unit X1 oscillation normal?
NO
Logic unit X1 malfunction
YES
Refer to service department.

PARTS LIST

[EF] UNIT

REF. NO.	DISCRIPTION	PART NO.
IC1	7SEG. LED	TLR312
IC2	7SEG. LED	TLR312
IC3	7SEG. LED	TLR312
IC4	IC	TA7612AP
IC5	IC	78M05 or 7805
Q1	TRANSISTOR	2SC945K
Q2	TRANSISTOR	2SA1015
Q3	TRANSISTOR	2SC945
D1	LED	SLC-26UR
D2	LED	SLC-26GG
D3	LED	SLP-451B
D4	LED	SLC-26UR
D5	LED	LN433YP
D6	LED	LN433YP
D7	LED	LN433YP
D8	LED	LN433YP
D9	LED	LN433YP
D10	LED	LN233RP
D11	LED	LN233RP
D12	DIODE	1SS53 (IC-25A only)
D16	DIODE	1SS133
D18	DIODE	1SS53 (IC-25A only)
D20	DIODE	1SS133
D21	DIODE	15CD11
D22	LED	GL-9PR4
D23	DIODE	1SS53 (IC-25A only)
D24	DIODE	1SS53
D25	DIODE	1SS53
D26	DIODE	1SS53
D27	DIODE	1SS53
D28	DIODE	1SS133
D29	DIODE	1SS133
D30	DIODE	1SS133
D31	DIODE	1SS133
D32	DIODE	1SS133 (IC-25E only)
D33	DIODE	1SS133 (IC-25E only)
R1	VARIABLE	K121B1-5N1111 10KA
R2	VARIABLE	VM13A5M3211 10KB
R3	RESISTOR	330 R25
R4	RESISTOR	330 R25
R5	RESISTOR	1K R25
R6	RESISTOR	1K R25
R7	RESISTOR	1K R25
R8	RESISTOR	1K R25
R9	RESISTOR	1K R25
R10	RESISTOR	1K R25
R11	RESISTOR	1K R25
R12	RESISTOR	22K R25
R13	RESISTOR	1K R25
R14	RESISTOR	10K R25
R15	RESISTOR	10 R25
R16	RESISTOR	220K ELR10
R17	RESISTOR	47K R10
R18	RESISTOR	47K R10
R19	RESISTOR	47K R10
R20	RESISTOR	10K ELR10
R21	RESISTOR	10K R25
R22	RESISTOR	330 R25
R23	RESISTOR	22K ELR10

REF. NO.	DISCRIPTION	PART NO.
C1	CERAMIC	0.001 50V B
C2	CERAMIC	0.001 50V B
C3	CERAMIC	0.001 50V B
C4	CERAMIC	0.001 50V B
C5	CERAMIC	0.001 50V B
C6	CERAMIC	0.001 50V B
C7	ELECTROLY	0.47 50V RC2
C8	TANTALUM	0.47, 35V, CS15ER47M
C9	CERAMIC	0.001 50V B
C10	CERAMIC	0.001 50V B
J1	CONNECTOR	FM214-8SS(P) (MIC)
J2	CONNECTOR	SJ-296 (EXT SP)
J3	CONNECTOR	FM-MDFM (ANT)
P1	CONNECTOR	TL-25H-02-V1
P2	CONNECTOR	TL-25H-10-V1
P3	CONNECTOR	TL-25H-08-V1
P4	CONNECTOR	TL-25H-02-V1
P5	CONNECTOR	TL-25H-06-V1
P6	CONNECTOR	TL-25H-06-V1
P7	CONNECTOR	TL-25H-07-V1
P8	CONNECTOR	TL-25H-05-V1
P9	CONNECTOR	TL-25H-04-V1
P10	CONNECTOR	TL-25H-04-V1
P11	CONNECTOR	TL-25H-04-V1
P12	CONNECTOR	1490-4P
P13	CONNECTOR	TL-25P-02-V1
P14	CONNECTOR	001T-4100 1P
P15	CONNECTOR	001T-4100 1P
SP1	SPEAKER	C060A20A000
S1	ROTARY ENCODER	LA22602
S2	PUSH SWITCH	SPJ222N LOCK (IC-25A) SPJ222T (IC-25E)
S3	ROTARY SW	SBU2026C
S4	PUSH SWITCH	SPJ222C LOCK
S5	KEY SWITCH	KEC10901
S6	PUSH SWITCH	SPJ322N LOCK
S7	PUSH SWITCH	SPJ322N LOCK
S8	PUSH SWITCH	SPJ322N LOCK
S9	KEY SWITCH	KHG10901
S10	KEY SWITCH	KHG10901
B1	P.C BOARD	B-518 (DISP1)
B2	P.C BOARD	B-519 (DISP2)
B3	P.C BOARD	B-520 (SW1)
B4	P.C BOARD	B-521 (SW2)
B5	P.C BOARD	B-522 (SW3)
B6	P.C BOARD	B-525 (SW4)
B7	P.C BOARD	B-526 (SW5)
B8	P.C BOARD	B-523 (METER)
B9	P.C BOARD	B-524 (MIC)

[MAIN] UNIT

REF. NO.	DISCRIPTION	PART NO.
IC1	IC	4558D
IC2	IC	BA401
IC3	IC	μPC577H
IC4	IC	μPC2002H
IC5	IC	TC5082P (IC-25E only)
IC6	IC	MB3756
IC7	IC	ND487C1-3R
Q1	TRANSISTOR	2SC945P
Q2	FET	3SK74M
Q3	FET	3SK48
Q4	TRANSISTOR	2SC1571G
Q5	TRANSISTOR	2SC945
Q6	TRANSISTOR	2SC945P
Q7	TRANSISTOR	2SC383
Q8	FET	3SK74M
Q9	TRANSISTOR	2SC2053
Q10	TRANSISTOR	2SC763C
Q11	TRANSISTOR	2SC945P
Q12	TRANSISTOR	2SC945P
Q13	TRANSISTOR	2SC945P
Q14	TRANSISTOR	2SC945P
Q15	TRANSISTOR	2SC1571G
Q16	TRANSISTOR	2SC945 ANY RANK
Q17	TRANSISTOR	2SC945P
Q18	TRANSISTOR	2SC945P
Q19	TRANSISTOR	2SC945K
Q20	TRANSISTOR	2SC945 ANY RANK
Q21	TRANSISTOR	2SC945P
Q22	TRANSISTOR	2SA496Y or O
Q23	TRANSISTOR	2SC945
D1	DIODE	1SS53
D2	DIODE	1SS53
D3	DELETED	
D4	DELETED	
D5	DELETED	
D6	DELETED	
D7	DIODE	1SS53
D8	DIODE	1SS53
D9	DIODE	1SS53
D10	VARACTOR DIODE	1S2688ES
D11	DIODE	1N60
D12	DIODE	1N60
D13	DIODE	1N60
D14	DIODE	1N60
D15	DIODE	1SS53
D16	DIODE	1N60
D17	DIODE	1N60
D18	DIODE	1N4002
D19	DIODE	1SS53
D20	DIODE	1N60
D21	DIODE	1N60
D22	DIODE	1SS53
FI1	CRYSTAL FILTER	16M15B1
FI2	CERAMIC FILTER	CFU455E2
DS1	DISCRIMINATOR	CFY-455S
X1	CRYSTAL	HC43/U 17.355MHz
X2	CRYSTAL	CR3
X3	CRYSTAL	HC43/U 7.168MHz (IC-25E only)
L1	COIL	LS216

REF. NO.	DISCRIPTION	PART NO.
L2	COIL	LS216
L3	COIL	LS216
L4	COIL	LR116
L5	COIL	LR116
L6	COIL	LB83
L7	COIL	LB1-1-A
L8	COIL	LB1-1-A
L9	COIL	LB14A
L10	CHOKE	LW-19
L11	COIL	LS209
L12	COIL	LS-141A
L13	CHOKE	LB4 3R6
L14	CHOKE	LB4 100
L15	COIL	LS216
L16	COIL	LS211
L17	CHOKE	LW-19
L18	COIL	LS211
L19	COIL	LA121
L20	COIL	LA121
L21	COIL	LS-122
L22	COIL	LS-16
L23	CHOKE	102
L24	CHOKE	LW-16
R1	RESISTOR	100K ELR25
R2	RESISTOR	1K ELR25
R3	RESISTOR	2.2K ELR25
R4	RESISTOR	1.2K ELR25
R5	RESISTOR	100 ELR25
R6	RESISTOR	330 ELR25
R7	RESISTOR	100K ELR25
R8	RESISTOR	100K ELR25
R9	RESISTOR	10K ELR25
R10	RESISTOR	2.2K ELR25
R11	RESISTOR	1K ELR10
R12	RESISTOR	2.2K ELR25
R13	RESISTOR	47 ELR25
R14	RESISTOR	47 ELR25
R15	RESISTOR	100K ELR25
R16	RESISTOR	100K ELR25
R17	RESISTOR	5.6K ELR25
R18	RESISTOR	10K ELR25
R19	RESISTOR	1K ELR25
R20	RESISTOR	1.8K ELR25
R21	RESISTOR	6.8K ELR25
R22	RESISTOR	680 R25
R23	RESISTOR	10 R25
R24	RESISTOR	1K ELR25
R25	RESISTOR	680 ELR25
R26	RESISTOR	22K R25
R27	RESISTOR	820 ELR25
R28	RESISTOR	100 ELR25
R29	RESISTOR	1.8M ELR25
R30	RESISTOR	6.8K ELR25
R31	RESISTOR	5.6K R25
R32	RESISTOR	5.6K ELR25
R33	RESISTOR	5.6K ELR25
R34	RESISTOR	680 ELR25
R35	RESISTOR	100 ELR25
R36	TRIMMER	H0651A 470
R37	RESISTOR	15K ELR25
R38	RESISTOR	220K ELR25
R39	RESISTOR	4.7K ELR25
R40	RESISTOR	4.7K ELR25
R41	THERMISTOR	23D29
R42	RESISTOR	3.3K ELR25
R43	RESISTOR	39K ELR25
R44	RESISTOR	22K ELR25

REF. NO.	DISCRIPTION	PART NO.
R45	RESISTOR	33K ELR25
R46	RESISTOR	22K ELR25
R47	RESISTOR	100 ELR25
R48	RESISTOR	2.7K ELR25
R49	RESISTOR	47 ELR25
R50	RESISTOR	1K ELR25
R51	RESISTOR	1K ELR25
R52	RESISTOR	5.6K ELR25
R53	RESISTOR	100 ELR25
R54	RESISTOR	100K ELR25
R55	RESISTOR	100K ELR25
R56	RESISTOR	4.7K ELR25
R57	RESISTOR	10 ELR10
R58	RESISTOR	470 ELR25
R59	RESISTOR	22 ELR25
R60	RESISTOR	47K ELR25
R61	RESISTOR	150K ELR25
R62	RESISTOR	1K ELR25
R63	RESISTOR	47 ELR25
R64	RESISTOR	1.5K ELR25
R65	RESISTOR	1.5K ELR25
R66	RESISTOR	1.5K ELR25
R67	RESISTOR	1.5K ELR25
R68	RESISTOR	4.7K ELR25
R69	RESISTOR	47 ELR25
R70	RESISTOR	1K ELR25
R71	RESISTOR	120 ELR25
R72	RESISTOR	150 ELR25
R73	RESISTOR	10K ELR25
R74	RESISTOR	3.3K ELR25
R75	RESISTOR	4.7K ELR25
R76	RESISTOR	15K ELR25
R77	RESISTOR	10K ELR25
R78	RESISTOR	2.2K ELR25
R79	RESISTOR	100 ELR25
R80	TRIMMER	H0651A 10K
R81	RESISTOR	47 ELR25
R82	RESISTOR	10K ELR25
R83	RESISTOR	10K ELR25
R84	RESISTOR	3.3K ELR25
R85	RESISTOR	18K ELR25
R86	RESISTOR	4.7K R25
R87	RESISTOR	39K ELR25
R88	RESISTOR	4.7K ELR25
R89	RESISTOR	150K ELR25
R90	RESISTOR	4.7K ELR25
R91	RESISTOR	1K ELR25
R92	RESISTOR	47 ELR25
R93	RESISTOR	5.6K ELR25
R94	RESISTOR	15K ELR25
R95	RESISTOR	5.6K ELR25
R96	RESISTOR	100 ELR25
R97	RESISTOR	6.8 ELR25
R98	RESISTOR	100 ELR25
R100	TRIMMER	H0651A 100K (IC-25E only)
R101	RESISTOR	100 ELR25
R102	THERMISTOR	33D28
R103	RESISTOR	2.7K ELR25
R104	RESISTOR	27K ELR25
R105	RESISTOR	1K ELR25
R106	RESISTOR	22K ELR25
R107	RESISTOR	4.7K ELR25
R108	RESISTOR	1K ELR25
R109	RESISTOR	4.7K ELR25
R110	TRIMMER	H0651A 33K
R111	RESISTOR	10K ELR25
R112	RESISTOR	15K ELR25

REF. NO.	DISCRIPTION	PART NO.
R113	RESISTOR	22K ELR25
R114	RESISTOR	100K ELR25
R115	RESISTOR	100K ELR25
R116	TRIMMER	H0651A 3.3K
R117	RESISTOR	150K ELR25
R118	RESISTOR	1K R25
R119	RESISTOR	1K R25
R120	RESISTOR	47K ELR25
R121	RESISTOR	47K ELR25
R122	RESISTOR	15K ELR25
R123	TRIMMER	H0651A 3.3K
R124	RESISTOR	5.6K ELR25
R125	RESISTOR	22K ELR25
R126	RESISTOR	1M ELR25
R127	RESISTOR	10K ELR25
R128	RESISTOR	2.2K ELR25
R129	RESISTOR	330 ELR25
R130	JUMPER	JPW-02H
R131	RESISTOR	15K ELR10
R132	RESISTOR	10K ELR10
R133	RESISTOR	22K ELR10
R134	RESISTOR	47K ELR25
R135	RESISTOR	100 ELR25
R136	RESISTOR	100 ELR25
R137	RESISTOR	47K ELR25
R138	RESISTOR	100 ELR25
R139	RESISTOR	1.8K ELR25
R140	RESISTOR	22K ELR25
R141	RESISTOR	2.2K R25
R142	RESISTOR	3.9K R25
R143	RESISTOR	6.8K ELR25
R144	RESISTOR	47K ELR25
R145	RESISTOR	47K ELR25
R146	RESISTOR	10K ELR25
R147	RESISTOR	1K ELR10 (IC-25E only)
R148	RESISTOR	10K ELR25 (IC-25E only)
R149	JUMPER	JPW-02A
R151	JUMPER	JPW-02H
R152	JUMPER	JPW-02H
C1	DIP MICA	30P 50V
C2	DIP MICA	100P 50V
C3	DIP MICA	100P 50V
C4	CERAMIC	0.0047 50V B
C5	CERAMIC	5P 50V SL
C6	CERAMIC	0.001 50V B
C7	CERAMIC	10P 50V SL
C8	CERAMIC	0.0047 50V B
C9	CERAMIC	0.0047 50V B
C10	CERAMIC	0.0047 50V B
C11	CERAMIC	0.001 50V B
C12	CERAMIC	10P 50V SL
C13	CERAMIC	20P 50V SL
C14	CERAMIC	10P 50V SL
C15	CERAMIC	0.0047 50V B
C16	CERAMIC	10P 50V SL
C17	CERAMIC	220P 50V SL
C18	CERAMIC	0.0047 50V B
C19	CERAMIC	2P 50V SL
C20	CERAMIC	0.0047 50V B
C21	CERAMIC	33P 50V SL
C22	ELECTROLY	1 50V B.P
C23	ELECTROLY	100 10V RE or MS
C24	CERAMIC	0.001 50V B
C25	BARRIER LAY	0.047 25V
C26	CERAMIC	0.001 50V B

REF. NO.	DISCRIPTION	PART NO.	
C27	CERAMIC	0.0047	50V B
C28	ELECTROLY	100	10V
C29	BARRIER LAY	0.01	TBD05X103
C30	BARRIER LAY	0.01	TBD05X103
C31	MYLAR	0.0022	50V
C32	CERAMIC	0.0047	50V B
C33	ELECTROLY	10	10V
C34	BARRIER LAY	0.047	25V
C35	MYLAR	0.0047	50V
C36	BARRIER LAY	0.01	TBD05X103
C39	CERAMIC	0.0047	50V B
C40	CERAMIC	100P	50V XL
C41	CERAMIC	100P	50V YL
C42	CERAMIC	10P	50V SL
C43	CERAMIC	0.0047	50V B
C44	CERAMIC	10P	50V SL
C45	CERAMIC	0.0047	50V B
C46	CERAMIC	0.0047	50V B
C47	CERAMIC	2P	50V SL
C48	CERAMIC	0.0047	50V B
C49	CERAMIC	2P	50V SL
C50	CERAMIC	0.0047	50V B
C51	CERAMIC	220P	50V SL
C52	CERAMIC	3P	50V SL
C53	CERAMIC	7P	50V SL
C54	CERAMIC	47P	50V SL
C55	CERAMIC	220P	50V SL
C56	TRIMMER	CV05D2001	
C57	CERAMIC	22P	50V SL
C58	BARRIER LAY	0.1	25V
C59	BARRIER LAY	0.1	25V
C60	BARRIER LAY	0.1	25V
C61	BARRIER LAY	0.1	25V
C62	MYLAR	0.001	50V
C63	MYLAR	0.001	50V
C64	BARRIER LAY	0.01	TBD05X103
C65	BARRIER LAY	0.1	25V
C66	CERAMIC	220P	50V SL
C67	CERAMIC	0.001	50V B
C68	MYLAR	0.0022	50V
C69	BARRIER LAY	0.1	25V
C70	BARRIER LAY	0.1	25V
C71	BARRIER LAY	0.1	25V
C72	BARRIER LAY	0.1	25V
C73	ELECTROLY	4.7	10V RC2
C74	TANTALUM	2.2	16V
C75	MYLAR	0.001	50V
C76	MYLAR	0.001	50V
C77	BARRIER LAY	0.01	TBD05X103
C78	BARRIER LAY	0.047	35V
C79	MYLAR	0.0047	50V
C80	ELECTROLY	47	10V RE or MS
C81	BARRIER LAY	0.01	TBD05X103
C82	BARRIER LAY	0.01	TBD05X103
C83	BARRIER LAY	0.1	25V
C84	ELECTROLY	10	10V RC2
C85	CERAMIC	470P	50V B
C86	ELECTROLY	1	10V RE or MS
C87	ELECTROLY	470	16V RE or MS
C88	ELECTROLY	220	10V RE or MS
C89	ELECTORLY	100	10V RE or MS
C90	CERAMIC	0.0047	50V B
C91	BARRIER LAY	0.1	25V
		(IC-25E only)	
C92	BARRIER LAY	0.047	35V
		(IC-25E only)	
C93	CERAMIC	470P	50V B
		(IC-25E only)	

REF. NO.	DISCRIPTION	PART NO.	
C94	CERAMIC	47P	50V SL
		(IC-25E only)	
C95	CERAMIC	47P	50V SL
		(IC-25E only)	
C96	ELECTROLY	2.2	50V
C97	BARRIER LAY	0.1	25V
C98	BARRIER LAY	0.047	35V
C99	MYLAR	0.0022	50V
C100	BARRIER LAY	0.047	35V
C101	ELECTROLY	4.7	10V RC2
C102	ELECTROLY	10	10V RC2
C103	ELECTROLY	3.3	10V RC2
C104	CERAMIC	0.0047	50V B
C105	ELECTROLY	2.2	10V RC2
C106	ELECTROLY	470	16V MS or RE
C107	CERAMIC	220P	50V SL
C108	CERAMIC	220P	50V
C109	CERAMIC	0.0047	50V B
C110	CERAMIC	0.0047	50V B
C111	CERAMIC	0.001	50V B
C112	CERAMIC	0.001	50V B
C113	CERAMIC	0.0047	50VB
C114	ELECTROLY	0.47	10V RC2
C115	BARRIER LAY	0.1	25V
C116	BARRIER LAY	0.1	25V
C118	BARRIER LAY	47	16V
C119	BARRIER LAY	1	50V
C120	BARRIER LAY	0.1	25V
C121	BARRIER LAY	0.01	TBD05X103
C122	CERAMIC	220P	50V SL
C123	CERAMIC	470P	50V B
C124	CERAMIC	220P	50V SL
C125	CERAMIC	220P	50V SL
C126	CERAMIC	220P	50V SL
C127	CERAMIC	470P	50V B
C128	CERAMIC	0.001	50V B
C129	ELECTROLY	10	10V RC2
C130	CERAMIC	15P	50V SL
C131	CERAMIC	220P	50V SL
C132	BARRIER LAY	0.1	25V
J1	CONNECTOR	TL-25P-03-V1	
J2	CONNECTOR	TMP-J01X-A	
J3	CONNECTOR	TMP-J01X-A	
J4	CONNECTOR	TL-25P-10-V1	
J5	CONNECTOR	TL-25P-04-V1	
J6	CONNECTOR	TL-25P-02-V1	
J7	CONNECTOR	TL-25P-08-V1	
J8	CONNECTOR	TL-25P-08-V1	
J9	CONNECTOR	TMP-J01X-A	
B1	P.C BOARD	B-490	

[PLL] UNIT

REF. NO.	DISCRIPTION	PART NO.
IC1	IC	TC9123 BP
Q1	TRANSISTOR	2SC383 TM
Q2	TRANSISTOR	2SC763C
Q3	FET	3SK74M
Q4	TRANSISTOR	2SC763C
Q5	FET	2SK125
Q6	TRANSISTOR	2SC763C
Q7	TRANSISTOR	2SC763C
Q8	TRANSISTOR	2SC383 TM
D1	DIODE	1SS53
D2	ZENER	XZ068
D3	DIODE	1S953
D4	DIODE	1S953
D5	VARACTOR DIODE	1SV50
L1	COIL	LS-134
L2	COIL	LS-145
L3	CHOKE	5R6
L4	CHOKE	101
L5	CHOKE	101
L6	COIL	LW-19
L7	COIL	LB-73
L8	COIL	LW-19
L9	COIL	LW-19
L10	COIL	LS-211
X1	CRYSTAL	HC43/U 40.678MHz
X2	CRYSTAL	HC43/U 5.12MHz
R1	RESISTOR	4.7K R25
R2	RESISTOR	2.7K ELR25
R3	RESISTOR	4.7K ELR25
R4	RESISTOR	1.0K ELR25
R5	RESISTOR	4.7K ELR25
R6	RESISTOR	18K ELR25
R7	RESISTOR	1.2K ELR25
R8	RESISTOR	1K ELR25
R10	RESISTOR	470 R25
R11	RESISTOR	100 ELR25
R12	RESISTOR	68K ELR25
R13	RESISTOR	470 ELR25
R14	RESISTOR	100 ELR25
R15	RESISTOR	470 ELR25
R16	RESISTOR	1K ELR25
R17	RESISTOR	47 ELR25
R18	RESISTOR	100 ELR25
R19	RESISTOR	22K ELR25
R20	RESISTOR	5.6K ELR25
R21	RESISTOR	220 ELR25
R22	RESISTOR	1K ELR25
R23	RESISTOR	47K ELR25
R24	RESISTOR	2.2K ELR25
R25	RESISTOR	1K ELR25
R26	RESISTOR	15K ELR25
R27	RESISTOR	470 ELR25
R28	RESISTOR	470 ELR25
R29	RESISTOR	2.2 ELR25
R30	RESISTOR	150 ELR25
R31	RESISTOR	220 ELR25
R32	RESISTOR	220 ELR25
R33	RESISTOR	330 ELR25
R34	RESISTOR	5.6K ELR25
R35	RESISTOR	1.2K ELR25
R36	RESISTOR	33 ELR25
R37	RESISTOR	1.2K ELR25
R38	RESISTOR	5.6K ELR25
R39	RESISTOR	33 ELR25
R40	RESISTOR	47 ELR25
R41	RESISTOR	2.7K ELR25
R42	RESISTOR	1.8K ELR25
R43	RESISTOR	100 ELR25
R44	RESISTOR	220 R25
R45	RESISTOR	22 R25
R46	RESISTOR	120 ELR25
R47	JUMPER	JPW-02A
C1	CERAMIC	68P 50V SL
C2	TRIMMER	CV05D2001
C3	CERAMIC	10P 50V SL
C4	CERAMIC	0.001 50V B
C5	CERAMIC	47P 50V SL
C6	CERAMIC	33P 50V SL
C7	CERAMIC	0.0047 50V B
C8	CERAMIC	7P 50V SL
C9	BARRIER LAY	0.1 25V
C10	CERAMIC	0.0047 50V B
C11	CERAMIC	0.0047 50V B
C12	CERAMIC	0.0047 50V B
C13	CERAMIC	33P 50V SL
C14	CERAMIC	33P 50V SL
C15	CERAMIC	0.0047 50V B
C16	BARRIER LAY	0.1 25V
C17	ELECTROLY	47 10V
C18	CERAMIC	0.0047 50V B
C19	ELECTROLY	100 10V
C20	CERAMIC	220P 50V SL
C21	CERAMIC	0.0047 50V B
C22	CERAMIC	0.0047 50V B
C23	CERAMIC	10P 50V SL
C24	CERAMIC	0.0022 50V B
C25	ELECTROLY	2.2 50V
C26	DIP MICA	39P 50V
C27	DIP MICA	39P 50V
C28	TANTALUM	0.47 35V
C29	ELECTROLY	10 16V
C30	ELECTROLY	220 10V
C31	CERAMIC	470P 50V B
C32	CERAMIC	50P 50V XL
C33	CERAMIC	5P 50V CH
C34	CERAMIC	3P 50V SL
C35	CERAMIC	15P 50V SL
C36	CERAMIC	8P 50V SL
C37	CERAMIC	1P 50V SL
C38	CERAMIC	220P 50V SL
C39	CERAMIC	0.001 50V B
C40	CERAMIC	470P 50V B
C41	CERAMIC	47P 50V SL
C42	CERAMIC	0.0047 50V B
C43	CERAMIC	220P 50V SL
C44	CERAMIC	3P 50V SL
C45	CERAMIC	22P 50V SL
C46	CERAMIC	0.0047 50V B
C47	CERAMIC	220P 50V SL
C48	CERAMIC	0.0047 50V B
C49	CERAMIC	0.0047 50V B
C50	CERAMIC	0.0047 50V B
C51	CERAMIC	0.0047 50V B
C52	BARRIER LAY	0.1 25V
P1	CONNECTOR	TMP-P01X-A1
P2	CONNECTOR	TL-25H-03-A1
B1	P.C BOARD	B-504

[DRIVER] UNIT

REF.NO.	DISCRIPTION	PART NO.
IC1	IC	4028
IC2	IC	4511
IC3	IC	M54516
IC4	IC	μPD650-108
IC5	IC	4013
IC6	IC	MB14025
IC7	IC	4001 (UBP) (C)
IC8	IC	4069
Q1	TRANSISTOR	2SA1015
Q2	TRANSISTOR	2SA1015
Q3	TRANSISTOR	2SA1015
Q4	TRANSISTOR	2SC945 ANY RANK
Q5	TRANSISTOR	2SC945 ANY RANK
Q6	TRANSISTOR	2SC945 ANY RANK
Q7	TRANSISTOR	2SC945 ANY RANK
Q9	TRANSISTOR	2SC945 ANY RANK
Q10	TRANSISTOR	2SA1015
Q11	TRANSISTOR	2SC945 ANY RANK
Q12	TRANSISTOR	2SC945 ANY RANK
Q13	TRANSISTOR	2SA830 or 831
Q14	TRANSISTOR	2SD468
Q15	TRANSISTOR	2SA1015
Q16	TRANSISTOR	2SC945 ANY RANK
Q17	TRANSISTOR	2SA1015
Q18	TRANSISTOR	2SA1015
Q19	TRANSISTOR	2SC945 ANY RANK
Q20	TRANSISTOR	2SC945 ANY RANK
D1	DIODE	1S953
D2	DIODE	1SS53
D3	DIODE	1SS53
D4	DIODE	1S953
D5	DIODE	1SS53
D6	DIODE	1SS53
D7	DIODE	1SS53
D8	DIODE	1SS53
D9	DIODE	1SS53
D10	DIODE	1SS53
D11	DIODE	1SS53
D12	DIODE	1SS53
D13	DIODE	1SS53
D16	DIODE	1SS53
D17	DIODE	1SS53
D18	DIODE	1SS53
D19	DIODE	1SS53
D20	DIODE	1SS53
D21	DIODE	1SS53
D22	DIODE	1SS53 (1SS133)
D23	DIODE	1S953
D24	DIODE	1SS53
D25	DIODE	1S953
D26	DIODE	1S953
D27	DELETED	
D29	DIODE	1N4002
D30	DIODE	1N4002
D31	DIODE	1S953
D32	DIODE	1SS53
D33	DIODE	1SS53
D34	DIODE	1S953
D35	DIODE	1SS53 (IC-25A only)
D36	DIODE	1SS53 (IC-25E only)
D37	DIODE	1SS53 (IC-25A only)
D38	DIODE	1SS53
D39	ZENER	YZ045B
D41	DIODE	1S953

REF. NO.	DISCRIPTION	PART NO.
D42	DIODE	1SS53 (1SS133)
D43	DIODE	1SS53 (1SS133)
L1	CHOKE	LW-12
X1	CERAROCK	CSB400A
S1	SWITCH	SSS022
R1	RESISTOR	47K ELR25
R2	RESISTOR	47K ELR25
R3	RESISTOR	330 ELR25
R4	RESISTOR	47K ELR25
R5	RESISTOR	10K ELR25
R6	RESISTOR	6.8K ELR25
R7	RESISTOR	6.8K ELR25
R8	RESISTOR	6.8K ELR25
R9	RESISTOR	47 ELR25
R10	RESISTOR	47 ELR25
R11	RESISTOR	47 ELR25
R12	RESISTOR	47 ELR25
R13	RESISTOR	47 ELR25
R14	RESISTOR	47 ELR25
R15	RESISTOR	47 ELR25
R16	RESISTOR	330 ELR25
R17	RESISTOR	22K ELR25
R19	RESISTOR	100K ELR25
R20	RESISTOR	10K ELR25
R21	RESISTOR	100K ELR25
R22	RESISTOR	220K ELR25
R23	RESISTOR	150K ELR25
R24	RESISTOR	150K ELR25
R26	RESISTOR	22K ELR25
R27	RESISTOR	100K ELR25
R28	RESISTOR	39K ELR25
R29	RESISTOR	1M ELR25
R30	RESISTOR	270K ELR10
R31	RESISTOR	47K ELR25
R32	RESISTOR	22K ELR25
R33	RESISTOR	100 ELR25
R34	RESISTOR	100 ELR25
R35	RESISTOR	47K ELR25
R36	RESISTOR	47K ELR25
R37	RESISTOR	10K ELR25
R38	RESISTOR	47K ELR25
R39	RESISTOR	47K ELR25
R40	RESISTOR	1M ELR25
R41	RESISTOR	1.8M ELR25
R42	RESISTOR	220K ELR25
R43	ARRAY	RM-6-473 (47K)
R44	RESISTOR	150K ELR25
R45	RESISTOR	220K ELR25
R46	RESISTOR	1K ELR25
R47	TRIMMER	H0651A 100K
R48	RESISTOR	10K ELR25
R49	RESISTOR	1M ELR25
R50	RESISTOR	470K ELR25
R51	RESISTOR	100K ELR25
R52	RESISTOR	100K ELR25
R53	RESISTOR	100K ELR25
R54	RESISTOR	1K ELR25
R55	RESISTOR	680 ELR25
R56	RESISTOR	100K ELR25
R57	RESISTOR	47K ELR25
R58	RESISTOR	22K ELR25
R59	RESISTOR	1K ELR25
R60	RESISTOR	22K ELR25
R61	RESISTOR	1K ELR10

REF. NO.	DISCRIPTION	PART NO.	
R62	TRIMMER	H0651A 220K	
R63	RESISTOR	10K	ELR25
R64	RESISTOR	1M	ELR25
R65	RESISTOR	1.8K	ELR25
R66	RESISTOR	1K	ELR25
R67	RESISTOR	47K	ELR25
R68	RESISTOR	47K	ELR25
R69	RESISTOR	4.7K	ELR25
R70	RESISTOR	100K	ELR25
R71	RESISTOR	10K	ELR25
R72	RESISTOR	1K	ELR25
R73	RESISTOR	150	ELR25
R74	RESISTOR	22K	ELR25
R75	RESISTOR	22K	ELR25
R76	RESISTOR	680	ELR25
R79	RESISTOR	47K	ELR25
R80	JUMPER	JPW-02H	
R81	JUMPER	JPW-02H	
R82	JUMPER	JPW-02A	
R83	JUMPER	JPW-02A	
R84	JUMPER	JPW-02H	
R85	JUMPER	JPW-02H	
R86	JUMPER	JPW-02H	
R87	JUMPER	JPW-02H	
R88	JUMPER	JPW-02H	
R89	RESISTOR	390	ELR25
C1	ELECTROLY	10	10V RC2
C2	ELECTROLY	0.47	50V RC2
C3	ELECTROLY	4.7 BP	25V
C4	CERAMIC	100P	50V SL
C5	CERAMIC	100P	50V SL
C6	ELECTROLY	4.7	50V RC2
C7	ELECTROLY	4.7	50V RC2
C8	ELECTROLY	4.7	25VBP
C9	CERAMIC	0.0022	50V B
C10	BARRIER LAY	0.01	50V
C11	CERAMIC	0.001	50V B
C12	ELECTROLY	0.1	50V RC2
C13	CERAMIC	0.001	50V B
C14	ELECTROLY	0.1	50V RC2
C15	ELECTROLY	0.1	50V RC2
C16	DELETED		
C17	ELECTROLY	0.47	50V RC2
C18	ELECTROLY	47 10V	RE or CE
C19	ELECTROLY	0.47	50V RC2
C20	BARRIER LAY	0.1	25V
C21	ELECTROLY	100	10V
C22	ELECTROLY	470	16V
C23	BARRIER LAY	0.1	25V
C25	BARRIER LAY	0.047	35V
C26	TANTALUM	47	10V
J1	CONNECTOR	TL-25P-05-V1	
J2	CONNECTOR	TL-25P-04-V1	
J3	CONNCETOR	TL-25P-07-V1	
J4	CONNECTOR	TL-25P-06-V1	
J5	CONNECTOR	TL-25P-06-V1	
J6	CONNECTOR	TL-25P-02-V1	
J7	CONNECTOR	TL-25P-02-V1	
J8	CONNECTOR	TL-25P-04-V1	
J9	CONNCETOR	TL-25P-02-V1	
J10	CONNCETOR	TL-25P-02-V1	
J11	CONNECTOR	RT-01T-10B (1P)	
J12	CONNECTOR	RT-01T-1.0B	
P1	CONNECTOR	SMP03VB	
P2	CONNECTOR	TL-25H-02-A1	

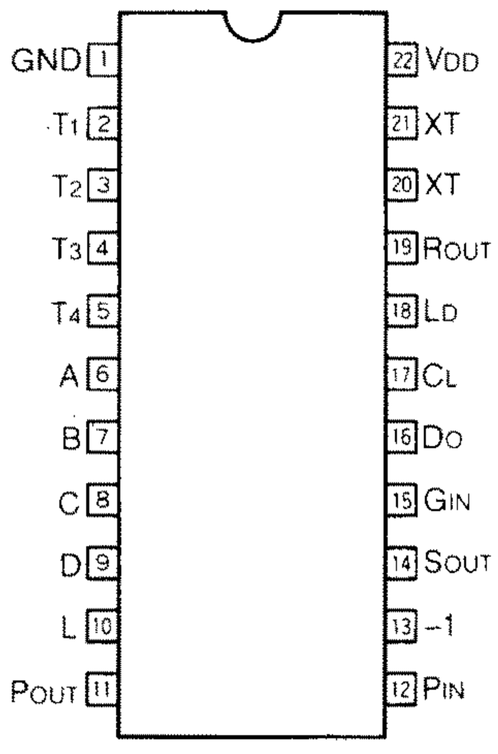
[PA] UNIT

REF. NO.	DISCRIPTION	PART NO.	
IC1	IC	SC1019	
D1	DIODE	MI402	
D2	DIODE	MI402	
D3	DIODE	MI301	
D4	DIODE	1SS97	
L1	CHOKE	LW-19	
L2	COIL	LA-127	
L3	COIL	LA-2	
L4	COIL	LA-2	
L5	COIL	LA-71	
L6	COIL	LW-19	
R1	RESISTOR	0.15	2W
R2	RESISTOR	120	ELR25
R3	RESISTOR	1K	ELR25
R4	RESISTOR	1.5K	ELR25
R5	RESISTOR	220	ELR25
R6	RESISTOR	4.7K	ELR25
C1	ELECTROLY	100	16V
C2	CERAMIC	220P	50V SL
C3	CERAMIC	220P	50V SL
C4	CERAMIC	220P	50V SL
C5	CERAMIC	15P	500V SL
C6	CERAMIC	220P	50V SL
C7	CERAMIC	220P	50V SL
C8	CERAMIC	0.0047	50V B
C9	CERAMIC	15P	500V SL
C10	CERAMIC	0.0047	50V B
C11	CERAMIC	0.001	500V B
C12	CERAMIC	0.5P	500V SL
C13	CERAMIC	18P	500V SL
C14	CERAMIC	2P	500V SL
C15	CERAMIC	33P	500V SL
C16	CERAMIC	3P	500V SL
C17	CERAMIC	27P	500V SL
C18	CERAMIC	220P	50V SL
P1	CONNECTOR	——	
P2	CONNECTOR	TL-25H-08-A1	
P3	CONNECTOR	TMP-P01X-A1	
P4	CONNECTOR	TMP-P01X-A1	
B1	P.C BOARD	B-503	

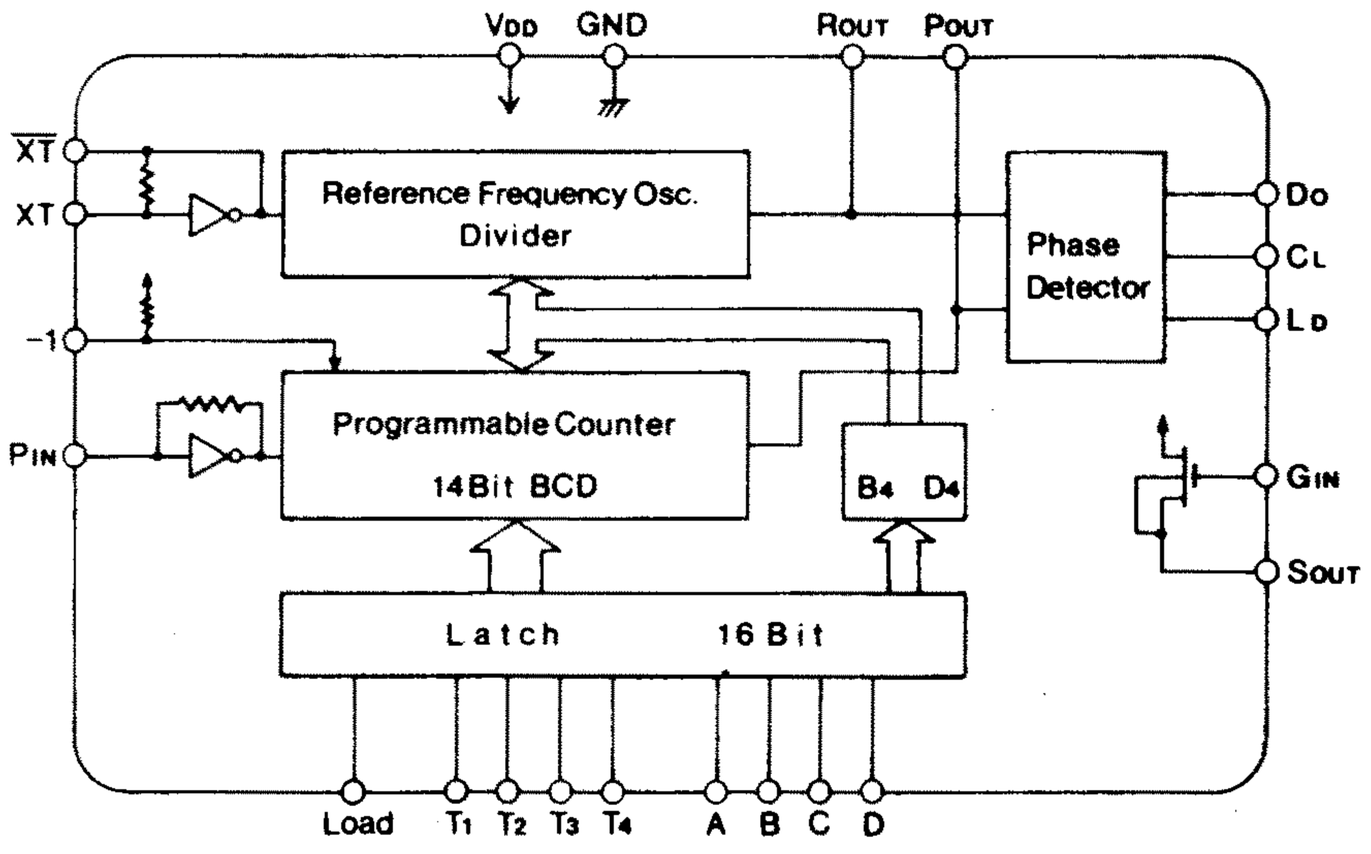
IC RATINGS

TC-9123P (FM/AM SYNTHESIZER TUNER PLL)

PIN CONNECTION



BLOCK DIAGRAM

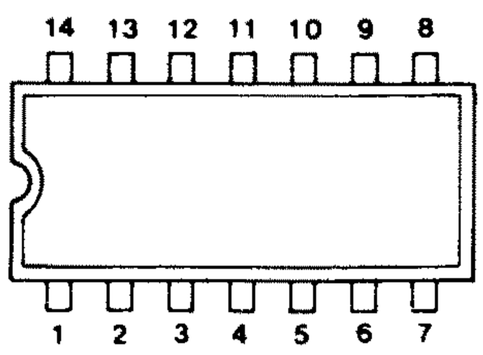


Maximum rating

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	−0.3 ~ 9.0	V
Input voltage	V_{IN}	−0.3 ~ V_{DD} +0.3	V
Operation temperature range	T_{OPR}	−30 ~ +70	°C
Storage temperature range	T_{STC}	−55 ~ +125	°C

TC4001 (QUAD 2-INPUT POSITIVE NOR GATE)
TC4013 (DUAL D-TYPE FLIP-FLOP)
TC4028 (BCD TO DECIMAL DECODER)
TC4069 (HEX INVERTER)

PIN CONNECTION



Maximum rating

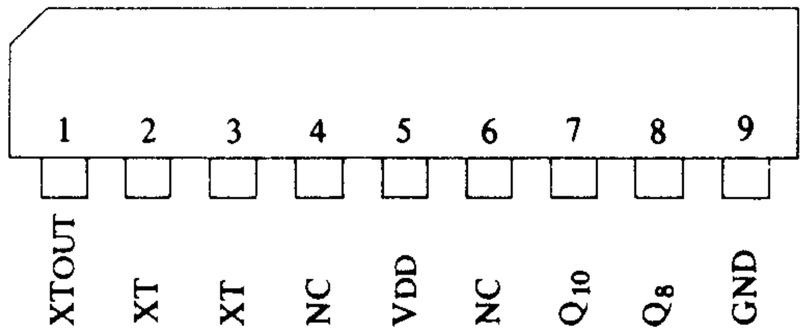
Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	Vss −0.5 ~ Vss +20	V
Input voltage	V_{IN}	Vss −0.5 ~ V_{DD} +0.5	V
Output voltage	V_{OUT}	Vss −0.5 ~ V_{DD} +0.5	V
Input current	I_{IN}	±10	mA
Permissible Dissipation	P_D	300	mW
Storage temperature range	T_{STG}	−65 ~ 150	°C
Lead temperature/time	T_{SOL}	260°C · 10Sec.	

TC-5082 (OSCILLATOR AND 10-STAGE DIVIDER)

Maximum rating

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	10	V
Input voltage	V_{IN}	$-0.3 \sim V_{DD} +0.3$	V
Operation temperature range	T_{OPR}	$-30 \sim 75$	°C
Storage temperature range	T_{STR}	$-55 \sim 125$	°C

PIN CONNECTION

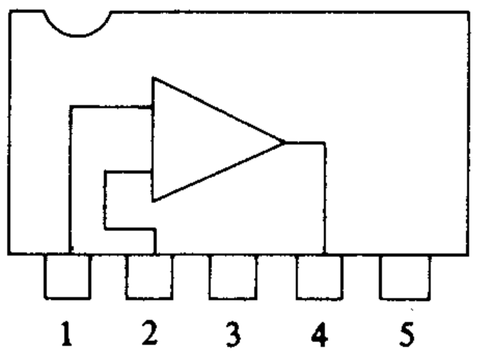


BA401 (FM/IF LIMITER)

Maximum rating

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	15	V
Output voltage	V_{OUT}	24	V
Input voltage	V_{IN}	±3	V
Operation temperature range	T_{OPR}	$-25 \sim +75$	°C
Storage temperature range	T_{STG}	$-55 \sim +125$	°C

BLOCK DIAGRAM

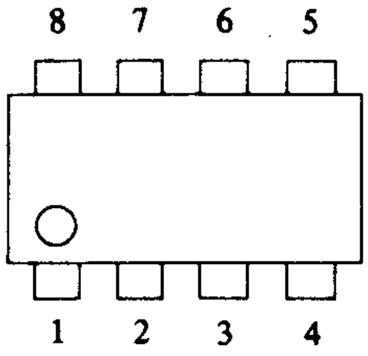


MJM4558D (DUAL LOW NOISE AMP.)

Maximum rating

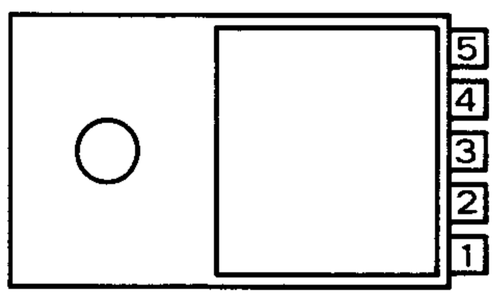
Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	18	V
Input voltage	V_{IN}	15	V
Operation temperature range	T_{OPT}	$-20 \sim +75$	°C
Storage temperature range	T_{STG}	$-40 \sim +125$	°C

PIN CONNECTION



μPC2002 (5.4-W AUDIO POWER AMP.)

PIN CONNECTION

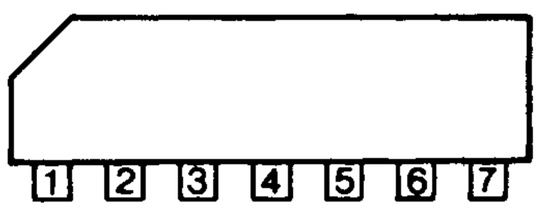


Maximum rating

Item	Symbol	Rating	Unit
Power supply voltage (surge)	V_{CC} 1 (50ms)	40	V
Power supply voltage (no-load)	V_{CC} 2	28	V
Power supply voltage (operation)	V_{CC} 3	18	V
Circuitry current (continuous pulse)	I_{CC}(PEAK)1	3.5	A
Circuitry current (single pulse)	I_{CC}(PEAK)2	4.5	A
Package Dissipation	P_D (T_C=90°C)	75	W
Operation temperature	T_{OPR}	−30 ~ +75	°C
Terminal-terminal voltage	T_{STG}	−40 ~ +150	°C

μPC577H (FM-IF AMPLIFIER)

PIN CONNECTION



Maximum rating

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	15	V
Terminal-terminal voltage	V_{IN}	±3.0	V
Permissible Dissipation	P_D	300	mW
Operation temperature	T_{OPT}	−20 ~ +75	°C
Storage temperature	T_{STG}	−40 ~ +125	°C

IC-25A/E SCHEMATIC DIAGRAM

MIC
POWER
VOL
LOW POW
SQL
WRITE
S/S
TONE
OFF SET + −
VFO 1 2 3 4 5
FULL S
PROG S
SIMP
DUP
NOR
REV
VFO A B
DIAL

25E ONLY
25A ONLY
PTT
DRIVER·PLL
MAIN
PA
ANT

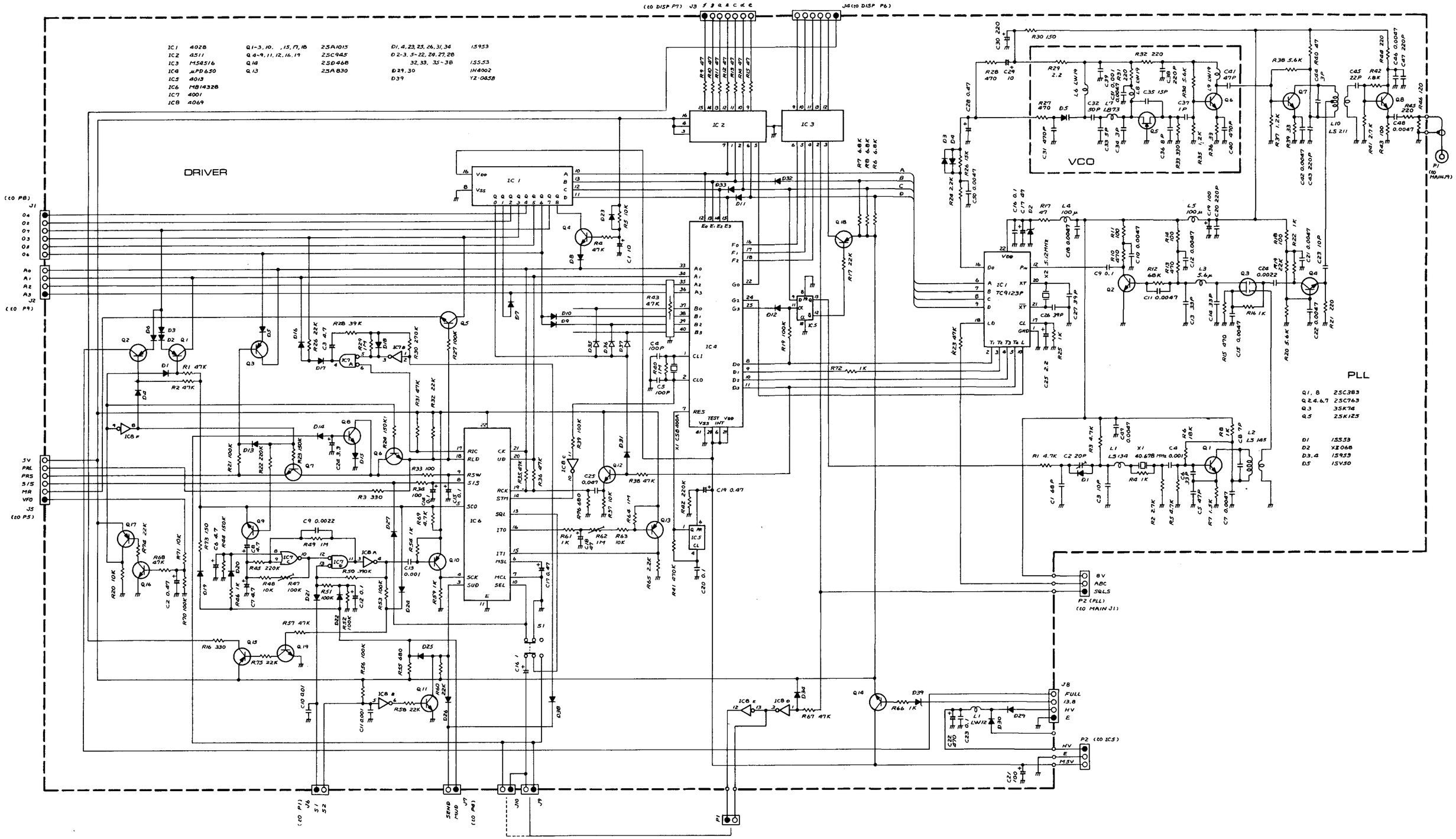
IC1 NJM4558D
IC2 BA401
IC3 μPC577H
IC4 μPC2002H
IC6 MB3756

IC1~IC3 TLR312

Some components subject to change for an improvement without notice.

ICOM ICOM INCORPORATED

A-0341

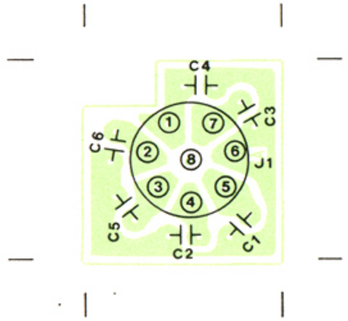

(to DISP P7)
J3
J4(to DISP P6)
IC1 4028
IC2 4511
IC3 M54516
IC4 μPD650
IC5 4013
IC6 MB14328
IC7 4001
IC8 4069
Q1-3, 10, 15, 17, 18 2SA1015
Q4-9, 11, 12, 16, 19 2SC945
Q14 2SD468
Q13 2SA830
D1, 4, 23, 25, 26, 31, 34 1S953
D2-3, 5-22, 24, 27, 28, 32, 33, 35-38 1SS53
D29, 30 IN4002
D39 YZ-0458
DRIVER
VCO
PLL
Q1, 8 2SC383
Q2,4,6,7 2SC763
Q3 3SK74
Q5 2SK125
D1 1SS53
D2 XB068
D3,4 1S953
D5 1SV50
(to PB)
J1
J2
(to P9)
J5
(to P5)
3V
PRL
PRS
SIS
MR
VFO
(to P1)
J6
S1
S2
SEND
MUD
J7
(to P8)
J10
J9
P1
P2 (PLL)
(to MAIN J1)
8V
ABC
SQLS
J8
FULL
13.8
HV
E
P2 (to IC5)
HV
E
M3V
(P)
(to MAIN 9)

ICOM

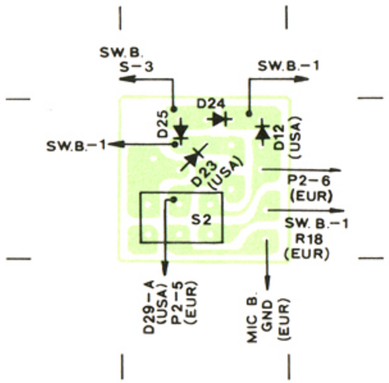
IC-25A/E

EF UNIT

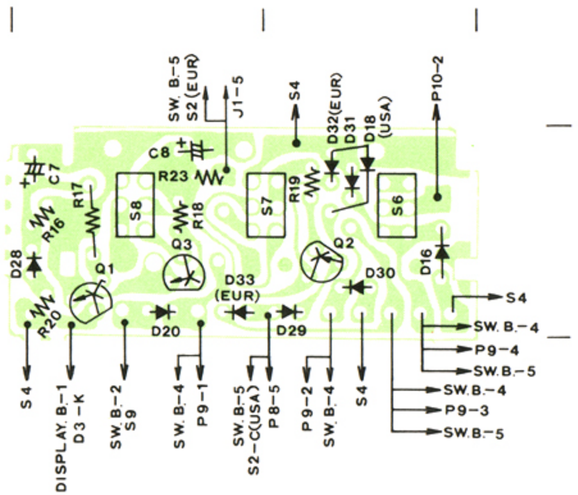
■ MIC BOARD

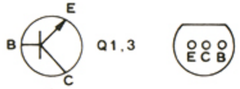


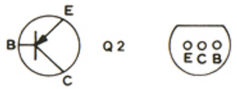
■ SWITCH BOARD (5)



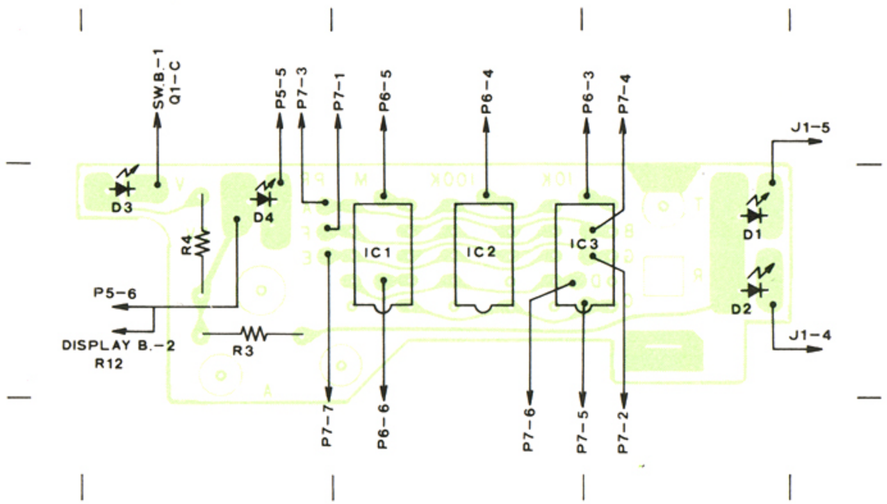
■ SWITCH BOARD (1)





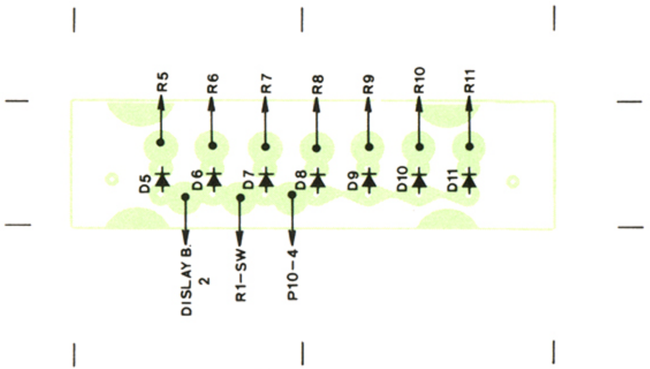


■ DISPLAY BOARD (1)

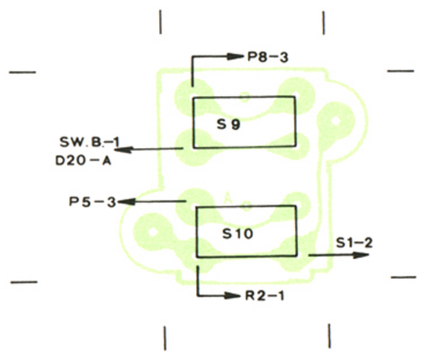


BOARD LAYOUT

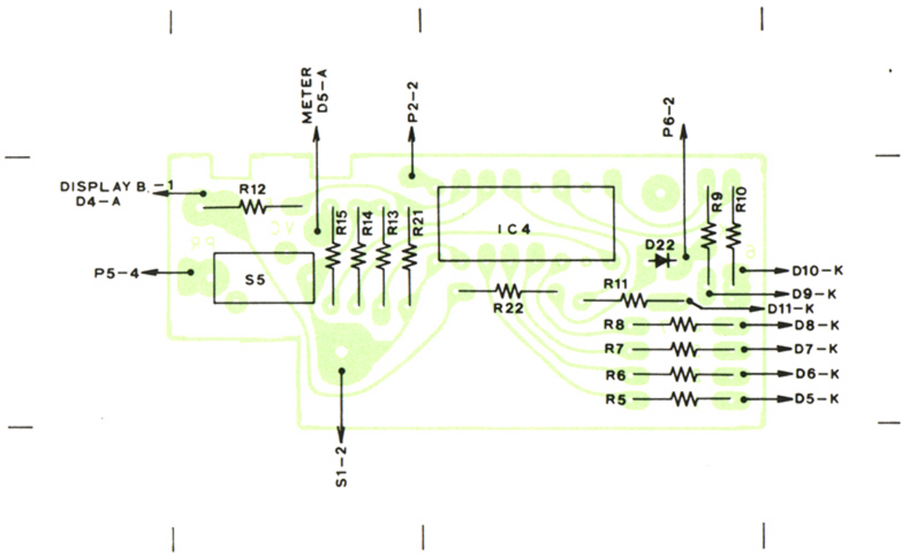
■ METER BOARD



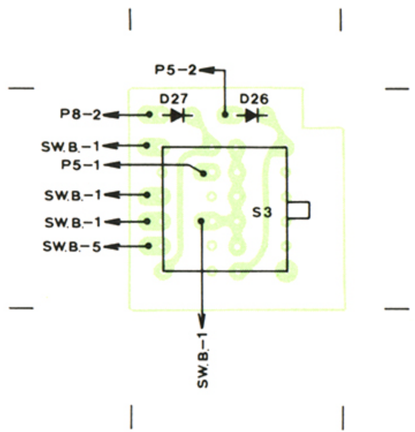
■ SWITCH BOARD (2)



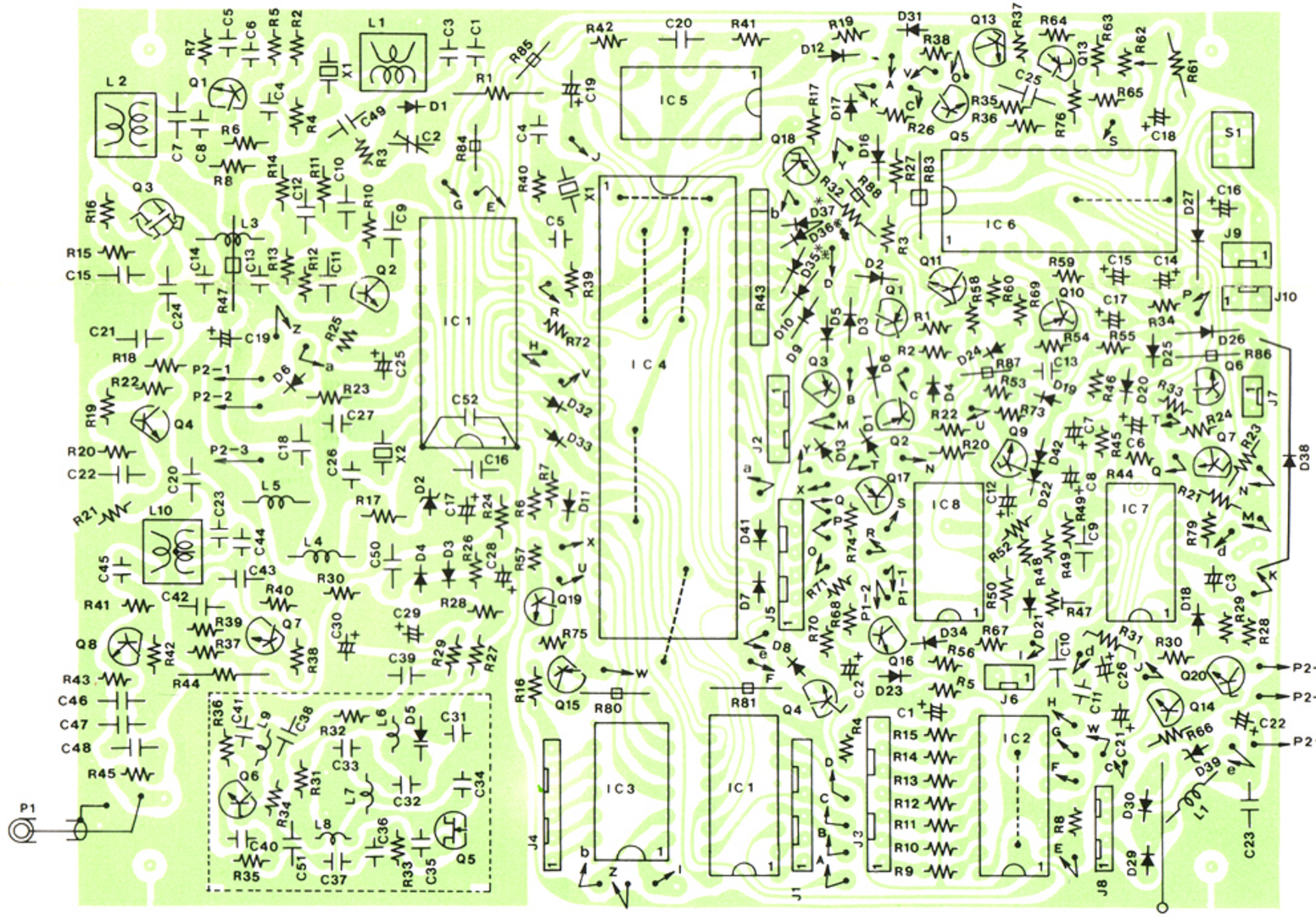
■ DISPLAY BOARD (2)



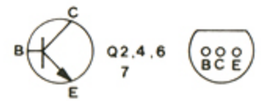
■ SWITCH BOARD (3)



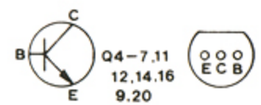
PLL · DRIVER UNIT

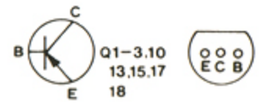


PLL



DRIVER



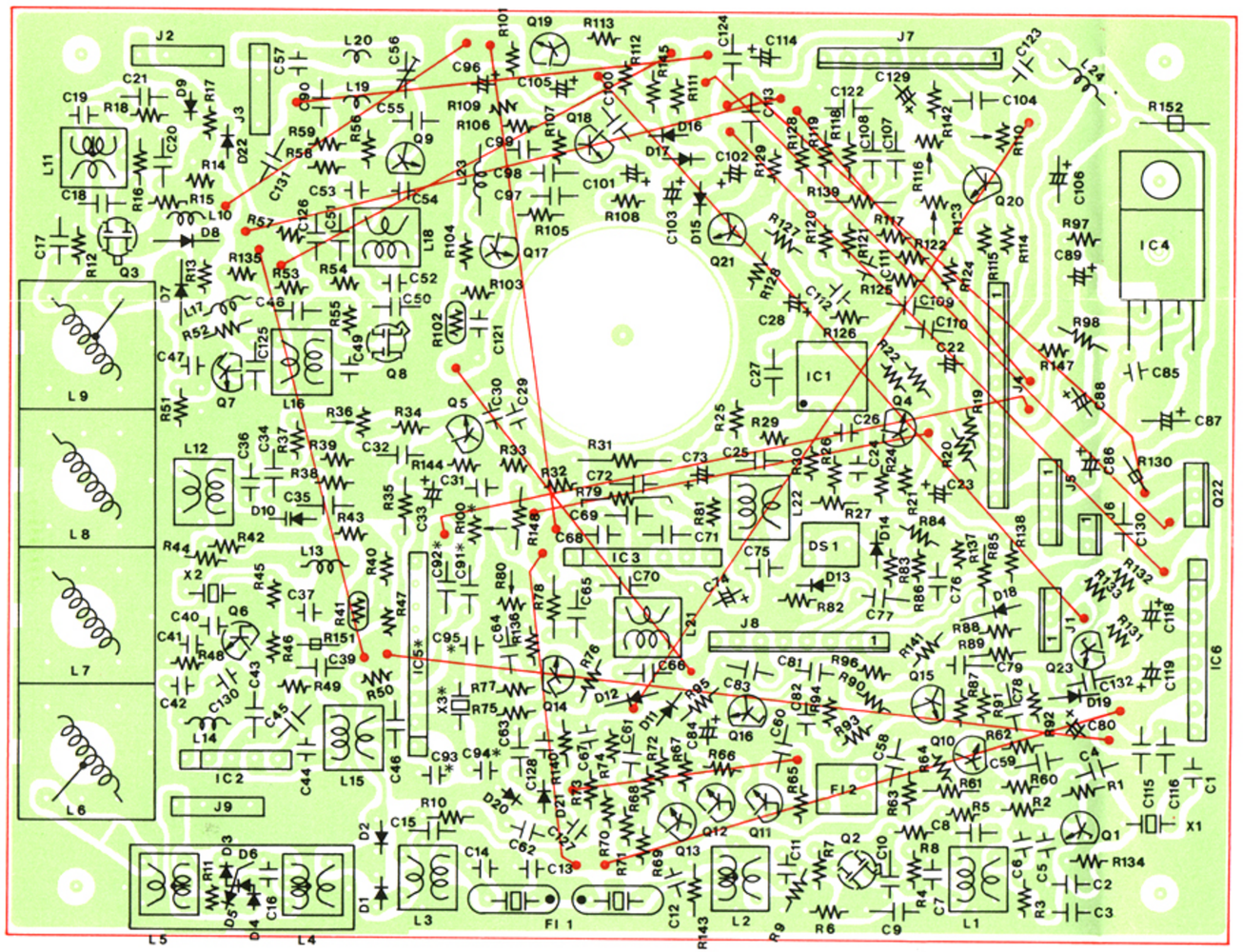


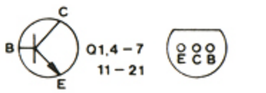
* USA

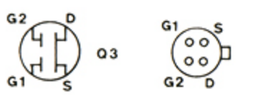
$ EUR 2MHz

※ EUR 4MHz

MAIN UNIT

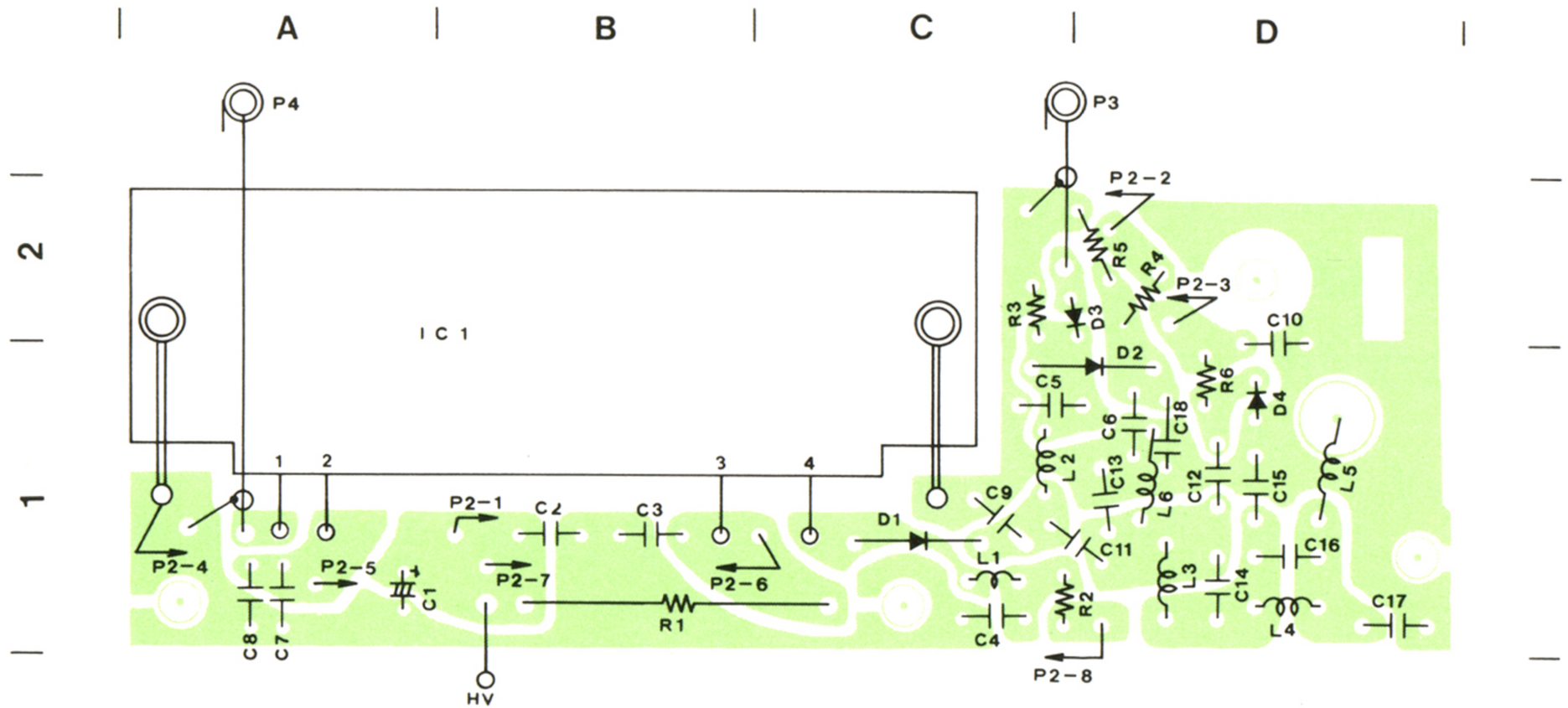




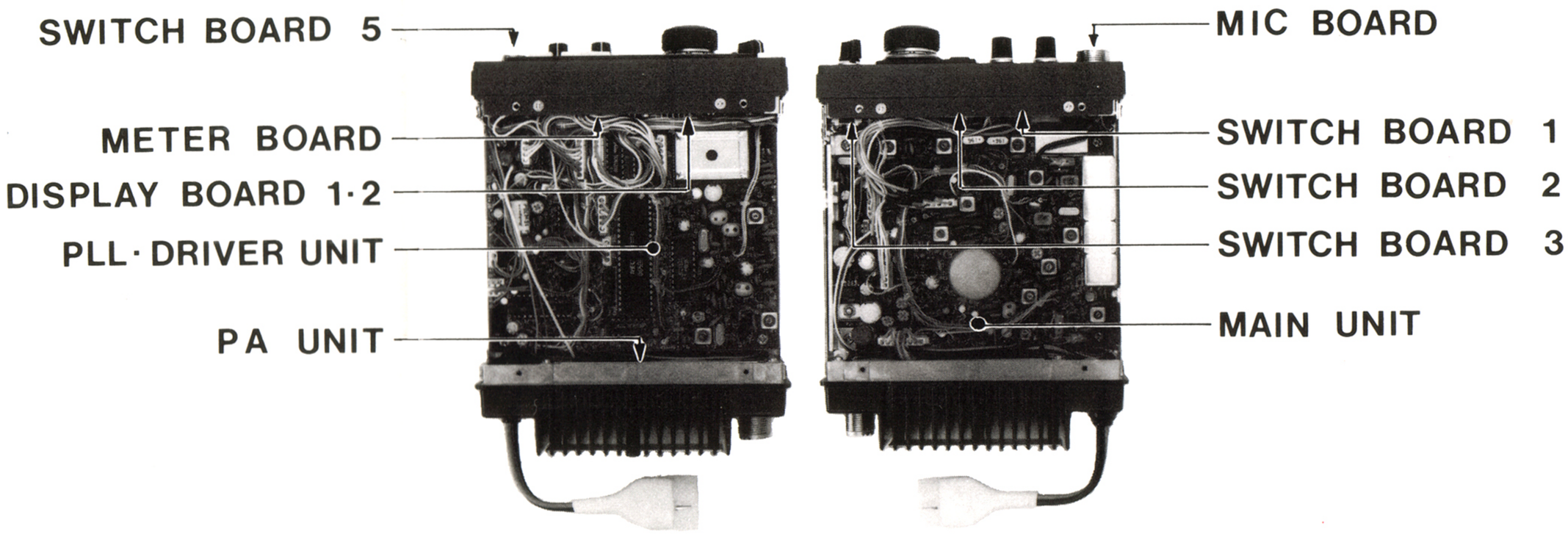


* EUR ONLY

PA UNIT


A
B
C
D
1
2
P4
P3
IC1
P2-1
P2-2
P2-3
P2-4
P2-5
P2-6
P2-7
P2-8
HV
R1
R2
R3
R4
R5
R6
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
D1
D2
D3
D4
L1
L2
L3
L4
L5
L6

UNIT LAYOUT


SWITCH BOARD 5
METER BOARD
DISPLAY BOARD 1·2
PLL·DRIVER UNIT
PA UNIT
MIC BOARD
SWITCH BOARD 1
SWITCH BOARD 2
SWITCH BOARD 3
MAIN UNIT